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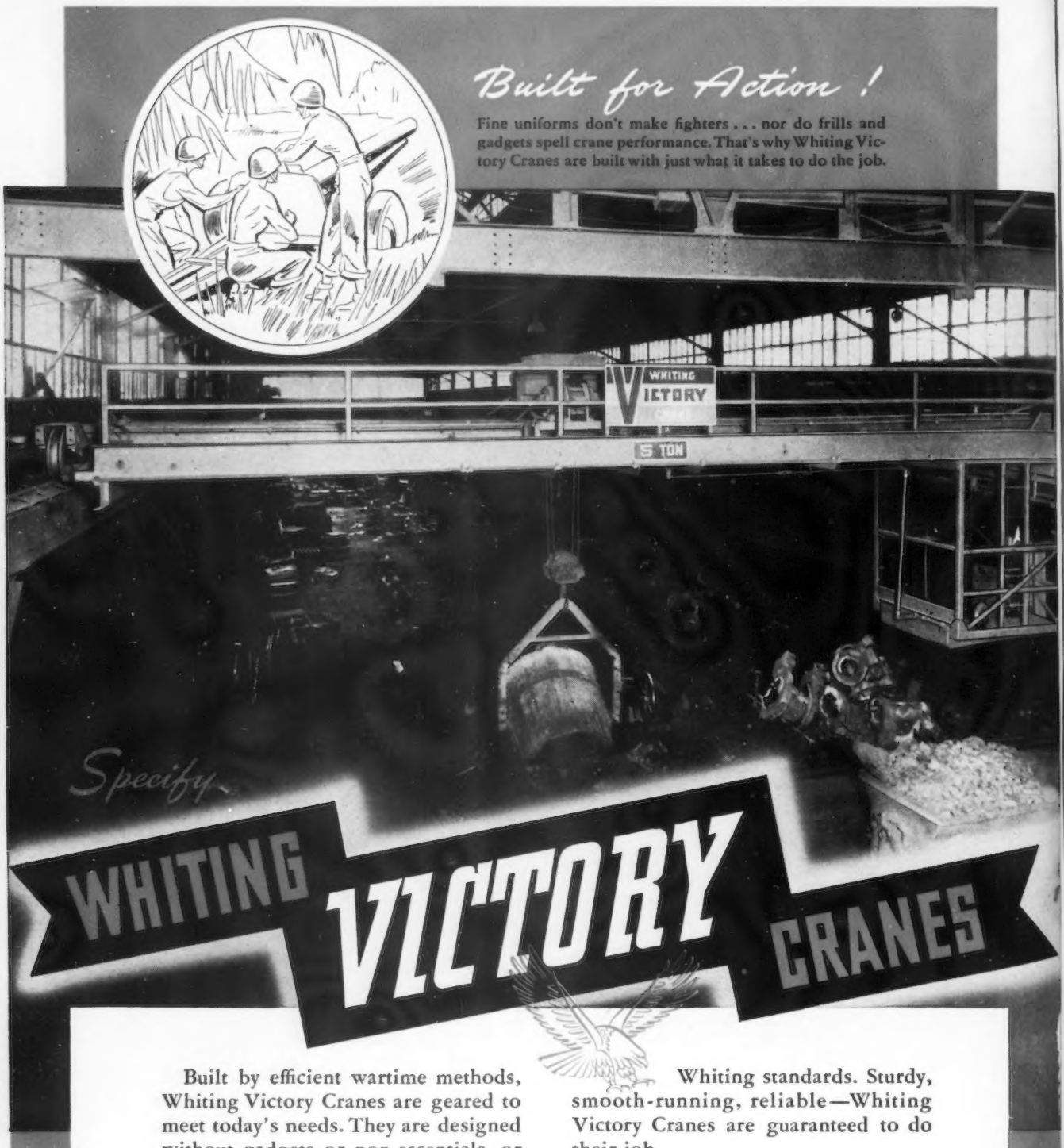
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The Great Enigma

THESE editorials are written one week in advance of publication. Things happen so fast nowadays that one is likely to be a year behind the times if he ventures to publish something that is written the day before yesterday.

Today I am going to write about John L. Lewis, the bushy eyebrowed commander-in-chief of the coal miners.

Mr. Lewis has what it takes to be a commander-in-chief, not merely in word, but in fact. He has the super ability to command obedience not merely to spoken orders but to unspoken ones. This exceptional talent keeps him out of the "hoosegow" while at the same time taking his followers out of the mines.

If Mr. Lewis had actually ordered a strike in our most essential industry and thus threatened the cause for which 129,500,000 other Americans are fighting, he could have been clapped in jail to cool his heels and to read Shakespeare under any number of laws relating to conspiracy, sabotage or what have you. But canny John, like Br'er Rabbit, just sets still and says nothin'. His followers are mind readers.

Not that I think we should clap John in jail. That would be the final blow to the remaining self respect of those unfortunates who are already in there, many of whom have announced their desire to be permitted to fight for, rather than against, their country.

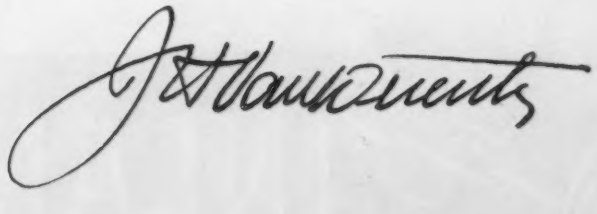
Personally, I think that there would be a much better way to dispose of him, if the law permitted. Namely to incarcerate him in the cage of Gargantua the great, of Ringling Brothers' circus, where he might quite well feel at home, both as to appearance and disposition. But here again, I may be doing Gargantua an injustice.

But let's get back to fundamentals. Let's grant, as Attorney General Biddle has said, that we have a labor government today in the United States.

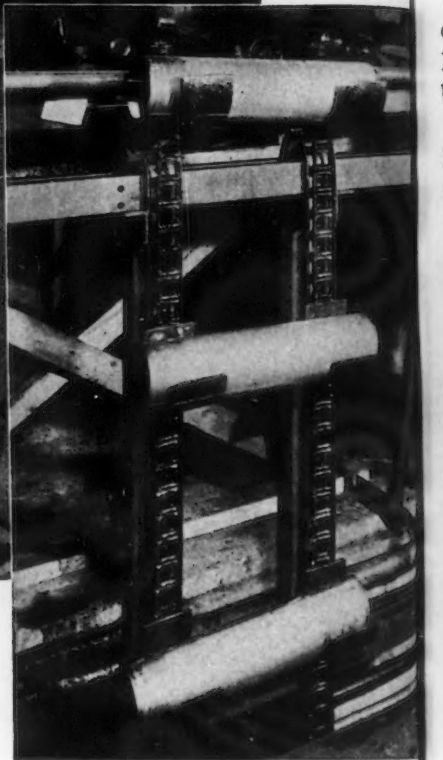
Don't you believe, as I do, that if labor were free to express its convictions it would be overwhelmingly in favor of doing everything possible to win this war, regardless of the sacrifices entailed? If you don't believe that then your future outlook is indeed a dismal one for labor constitutes by far the larger part of our population.

I do not believe that the great mass of American labor likes to see a little minority of it that wears the Lewis collar defy and outface the commander-in-chief of our Army and Navy and President of the United States. If that came to pass it would be about time to call in a strong man like Joe Stalin who apparently knows how to drive his horses.

By the time this is published, this thing may be settled. But unless it is settled by the complete elimination of one John Lewis from both labor and political power, more than his ghost will arise again to haunt us.



Here 7-in. cylinders are turned inside out and reduced to 6 in. diameter.



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4½" x 17" Steel Cylinders— *Drawn from Inland Sheets*

Only four operations are necessary to form a 4½-in. diameter by 17 in. deep cylinder that is part of a shell container used by the U. S. Navy.

In the first operation an 18-in., 19-gage, blank, cut from Inland deep drawing sheets, is formed into a cylinder 10 in. in diameter by 6 in. deep. The second operation reduces the diameter to 7 in. and increases the depth to 8⅞ in. In the third operation a 7-in. by 8⅞-in. cylinder is placed bottom end up over the lower die. The upper die, pressing against the bottom of the 7-in. cylinder, forces it into the lower die, turning the cylinder inside out while reducing the diameter to 6 in. and increasing the length to 12⅝ in. In the final operation a 6-in. cylinder is placed over the upper die which forces it through a ring die, drawing the cylinder to final size, 4½ in. in diameter by 17 in. deep.

These cylinder forming operations, like many other difficult war jobs, are proof of the uniformity and high quality of Inland flat rolled steel products—products that are being used 100% for Victory.

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The IRON AGE
JUNE 10, 1943

NEWS FRONT

The serious and sinister growing race problem in Michigan plants is believed by many factory executives to be definitely the work of Axis agents.

Surplus war property, exclusive of plants, will amount to at least $50 billion after hostilities cease, and may be a $100 billion hot potato. Jockeying has already started in the coming ill-defined but bitter conflict between the concepts of using the material to good advantage and disposing of it with minimum of impact on interests of any sort. Any conceivable disposition will arouse convincing critical attack. Incidentally, plenty of scandals grew on the sale of only $4 billion surplus after World War I.

Kaiser's pig iron and steel slab ingots are getting to be almost a drug on the Pacific Coast. About 900 tons of slab ingots have been offered to Inland, but no sale. This week, the 900-ton Ironton, Utah stack (moved from Joliet, and rebuilt) of U. S. Steel Corp. blows in, and this will contribute further to the temporary western overbalance of pig iron, the indicated pig iron surplus by mid-August being about 80,000 tons.

The Fontana, Cal. plate mill probably won't be able to take slab ingots until early November. At Geneva, Utah, the U. S. Steel Corp. can't go into plate production until delivery of the slabbing mill, which will be at best by mid-November.

Captive mines are exploiting metallurgical coal reserves so drastically that quality continues to deteriorate. Poorer quality and inability to accumulate stocks are also the result of widespread development and retreat mining currently taking place.

The Navy persists in the cushy habit of ordering steel marked for a particular vessel, with a 10 per cent overage. Now some 800,000 tons of overage, more than half of it plates, has overflowed Navy Yard storage facilities. Inventory experts are breaking down the mess.

Shortage of films has turned German industry to use of Geiger Mueller counting tubes for metal testing. While not as good as film and fluorescent screen for small defects, the method is superior for large area defects, as differences in wall strength, corrosion under linings, etc. Germans also use it to test fuses for gunpowder charge defects.

Now that the shell program has been cut back 40 per cent in sizes other than 20 and 27 mm., several shell and bomb plants are rapidly converting to the production of steel shell cases in sizes from 75 to 155 mm.

Bomb production is off because this country is slated to supply only the needs of the Far East and Pacific theatres. To save shipping space, steel rounds and seamless pipe will be shipped to England at an increasing pace, and England will make all the bombs for the European KO.

Saving of shipping space likewise has dictated the sending of four complete steel drum fabricating plants to Africa and the Near East. Flat stock will come from this country.

America is outselling the British nine to one in Chile, but still Americans, a little jealous, continue to moan that Britain is sending a ship of metal goods a month to that country.

The steel industry, two years after Victory, will operate at about 75 per cent of war time capacity provided 57 million of the country's 60 million employables have jobs. To achieve this degree of prosperity, manufacturing, for instance, must provide 40 per cent more jobs than ever before in peace time.

Sponge iron is again enjoying political favor. North Carolina continues to shove ads in all the major papers; and Congressmen are breathing life into the idea of using South Dakota lignite with Minnesota iron oxide to produce a steel making metallic.

The unique wide Rohn cluster mill that has had a long experimental run, primarily on stainless, at the American Steel & Wire Co. plant, will soon be broken down for reconstruction into a conventional Steckel-type cold mill. The Rohn layout was intriguing and gave plenty of experience on the effect of rolling variables, but as a production unit it wasn't so hot.

Kirksite Die Casting Technique

By LEONARD C. COSTELLO
Procedure Control Analyst, North American Aviation, Inc.

. . . An abundance of potential pitfalls lurks in the casting of Kirksite dies. The die can be very easily spoiled in the melting or pouring of the alloy. The sand mold requires careful preparation. But by following the precautions carefully outlined here, extremely rapid die production is possible.

FULL advantage of the rapid die production made possible by Kirksite "A" can be realized only if the pattern shop, foundry and machine forming departments work together toward the casting of dies to produce the best fabricated parts. This requires, on the part of the plaster pattern maker, a complete study as to the number of parts to be fabricated, the method of fabrication, the press or hammer operation, metal factors, and the most economical method by which the die may be cast. Accuracy is important as the slightest error is costly in the final assemblies. The working and handling of wood patterns as well as plaster is another essential qualification of the plaster pattern maker.

With this sort of care and co-operation, a drawing for a simple die can be submitted to the pattern shop and 24 hr. later this die will be producing parts. This of course does not apply to large dies which sometimes take as much as 12 hr. to solidify and cool sufficiently for handling.

In the foundry, essential requirements are floor space which is not cramped, and service by an overhead crane of sufficient capacity to handle the heaviest die cast.

Due to the low melting point of the alloy (717 deg. F.), the manufacturer of Kirksite "A" recommends iron kettles or pots of the following analysis:

	per cent
carbon	3.00 to 3.50
silicon	1.00 to 2.00
manganese	0.60 to 0.75
nickel	2.00 to 2.50
chromium	1.10 to 1.20
molybdenum	0.40 to 0.60

Kettles or pots of this composition should be normalized at 1200 to 1400 deg. F. for 4 hr. and allowed to cool slowly for at least 12 hr. and preferably 40 hr., to room temperature. The inner surface should be ground smooth before normalizing. In this composition, the maganese, nickel and chromium are present to refine the grain and to reduce the rate of solubility of the iron in Kirksite "A," while the molybdenum toughens the structure so that it can better resist the heat shock incident to the rapid change in temperature on starting up. Welded steel kettles are attacked very rapidly by molten Kirksite "A."

After the kettle is cleaned, it is heated to about 200 deg. F. and iron oxide solution is applied in at least three coats for protection against the solvent action of the Kirksite alloy. The kettle is emptied after 200 or 300 hr. operation and the coating renewed.

When the melting pot is shut down, a small heel of the Kirksite alloy is

FIG. 1—Gas fired Kirksite "A" pot, of 6000-lb. capacity.

allowed to remain. A lifting hook is allowed to freeze in this heel, providing an easy way of emptying the kettle with a crane. The alloy on the sides of the kettle is peeled off and the rest burned out with a torch. The kettle is then warmed and recoated with the iron oxide solution. This solution will also prolong the life of ladles, skimmers and pyrometer protecting tubes.

The kettles are shallow bowl shaped, fired by gas, are of sufficient size to assure a plentiful supply of Kirksite for the largest die anticipated, and of sufficient diameter for the remelting of heavy dies. (Fig. 1.)

Hand ladles should be of about 40 lb. capacity. The skimmers consist of a slightly dished disk of thick steel, drilled with a generous number of ¼ in. holes. These skimmers can be made of steel or even wrought iron because they are not subjected to the continuous and severe service which the kettle must withstand.

After the kettle has been warmed up and protective coatings applied, a few ingots of Kirksite "A" are loaded into the kettle, the furnace is turned on full and as soon as the melting starts, additional ingots are added until the desired level is reached. Just before the melting is complete, the burners should be turned low by cutting in the temperature control, to keep the temperature from coasting over the safe maximum. At this point there is little or no scum or dross on the surface of the metal. It has been found that it is not economical to skim the pot until the drosses accumulate to form a thick blanket, as constant skimming exposes the new surfaces to oxidation and increases dross losses. In small molds when hand ladles are used, the dross layer is pushed back and clean metal lifted from the cleared spot. With larger molds, during pouring into the ladle, skimmers are used at the spout or lip of the kettle to remove the scum or dross (Fig. 2).

After the kettle is partially emptied, either obsolete dies or ingots are added to raise the level to cover the thermocouple protecting tube of the controller and to avoid oxidizing any alloy sticking to the sides of the kettle above the liquid level.

When it is necessary to hold the alloy in a molten state, the temperature control is set at 800 deg. F. If higher temperatures are held, iron dissolves from the kettle more rapidly and oxidation is accelerated. If lower temperatures are held, some segregation of copper occurs. The temperature controls are not changed even if there is no pouring at night. Under no circumstances is stirring necessary with accurate temperature control.

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FIG. 2—Pouring molten Kirksite. The more slowly the metal is poured, the sounder will be the casting. The stream of molten metal should be not more than ¾ in. in diameter.

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Because of heat shock to the kettle, it is never started up with a solidified heel of metal in it. The old heel is replaced as soon as the kettle is one-third filled with molten alloy.

As it is very difficult to break or cut obsolete Kirksite "A" dies, the only satisfactory method of disposing of them is by remelting. In remelting, sufficient molten alloy is always in the kettle to provide better heat transfer to the die. If the die to be remelted is too big to fit into the kettle safely, it can be held by the crane while first one and then another corner is melted away. Remelted dies, if not contaminated, can be treated as new alloys. Under this condition, no flux is needed.

If Kirksite bearings or other finely divided scrap are to be remelted they are added to molten alloy at 900 deg. F., a little at a time, and submerged with a stirring rod or a skimmer to avoid oxidation. At least 3 lb. of a 50-50 mixture of salammoniac and zinc chloride per ton of scrap makes a fairly satisfactory flux and is used occasionally. A special mixture of salts, prepared by the National Lead Co., when stirred vigorously into the remelted scrap is most effective in separating dirt and oxides so that they will float to the top of the melt. The operation creates heavy choking fumes, harmless but offensive. After the flux is stirred in, a rest period of 20 to 30 min. at 775 deg. F. is allowed for the heavier dross particles to float to the top of the melt. The drosses are then skimmed off with as little disturbance as possible.

Skimmings from the pot are accumulated and at intervals treated in the same manner as scrap. When the dross is dark gray in color and light in weight, it is discarded as it is of little value. The presence of bright metal in the dross indicates insufficient fluxing, too short a rest period, or improper skimming. The reclaimed alloy is cast into pigs and used, a little at a time, with new ingots.

Contamination

The addition of aluminum to zinc introduces a hazard not present in many other alloys. The presence of lead or tin even in very small quantities is extremely detrimental to the aging characteristics of zinc-aluminum alloy, making it imperative that only the purest zinc obtainable be used in making Kirksite "A" and that extreme care be exercised to exclude lead and tin from the melting kettles. As little as 0.01 per cent of lead will cause losses in physical properties on aging, 0.5 per cent will cause a loss of one-third of the tensile strength

For other operating data on Kirksite and on aircraft sheet metal forming, see the following articles in THE IRON AGE:

"Briggs Aids Aircraft Production," Jan. 8, 1942.

"Drawing Dies for Airframe Stampings," May 28, 1942.

"Stretch Forming Contoured Sheet Metal Aircraft Parts," June 4, 1942.

"Forming Convex Flanges and Joggles," June 11, 1942.

"Hydro-Press Forming with Rubber Platens," June 11, 1942.

"Unique Aircraft Construction Methods," June 25, 1942.

"Multiple Subpress Dies for Aircraft Fabrication," Aug. 27, 1942.

"Stretch Forming Speeds Aircraft Production," Oct. 1, 1942.

"Plastic Punches Form Aircraft Sheet Metal," Feb. 18. 1943.

"Production Short Cuts," March 11, 1943.

"Coring Kirksite Dies," April 8, 1943.

and 75 per cent of the impact strength and an expansion of the dies of ⅛ in. per ft., in one year of normal indoor aging. The effect of tin contamination are at least as serious as those of lead. Once either of these elements is allowed to get into the alloy, nothing can be done to remove it. The original properties are restored on remelting, but the aging losses again begin as soon as the recast casting cools.

The presence of iron in quantities greater than 0.25 per cent is also harmful and care must be taken to protect the kettles and all iron tools from direct contact with the molten alloy. The rate of solution of iron in Kirksite "A" increases rapidly with increases in temperature. The melt must be kept below 900 deg. F. at all times.

Excess iron will produce, on all vertical walls of the castings, deeply etched defects resembling borings of an insect, giving rise to the descriptive term, "dural-bug-marks."

Iron will float as an iron-aluminum compound, when the melt is held quietly for about 1 hr. at 775 deg., and can be skimmed off.

Molding

The necessity of using sturdy flasks in various sizes, high quality molding sand, and adequate tools cannot be over-emphasized. The flasks are made of heavy lumber mortized at the joints and strengthened by through bolts across the ends. The use of trunnions at the centers of the ends of the flasks simplifies the task of rolling the flasks over, and reduces the danger of cracking the sand mold.

To remove very heavy patterns from the sand smoothly and with a minimum of rapping, a pair of lifting bars and clamps (Fig. 3) is found to be of great value. The ends of the bars, which are long enough to extend the width of the widest flask, bear on blocks resting on the side of the flask. The blocks, drilled to the outside diameter of the bars, have threaded end hooks to engage eyes set in the pattern. Two men with very little rapping can lift the largest mold from a flask by using these lifting tools.

The open mold method has proved satisfactory (Fig. 4). As the alloy solidifies, molten metal is drawn from the heavier sections to the lighter, and unless there is an ample supply of molten metal, the forces set up by the solidification are great enough to pull portions of the frozen surface inward, causing draws, or to draw molten particles out of a partly solidified section, causing porosity. Attempts to produce castings having heavy sections in a closed mold have proved unsuccessful, even though heavy risers were supplied. In producing castings with light walls, the closed mold can be used, but even then it is difficult to obtain a perfect casting. The drag, or bottom, surface is usually better than the top, or cope, side.

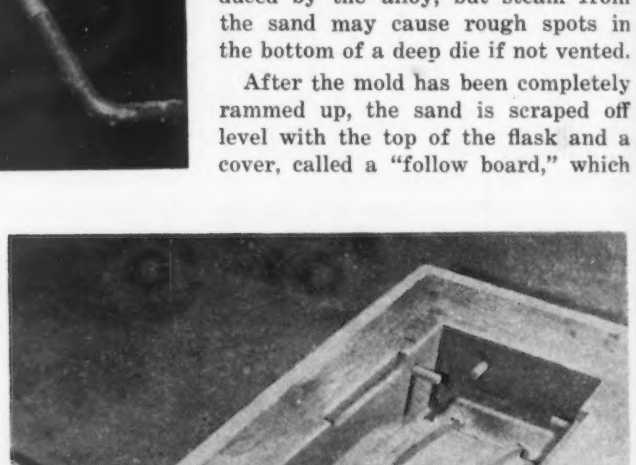
ABOVE

FIG. 3 — Lifting clamps for removing heavy patterns from the sand with a minimum of rapping.

o o o

RIGHT

FIG. 4 — Open mold. In producing castings with light walls, the closed mold can be used, but even then it is difficult to obtain a perfect casting. The open mold method has proved satisfactory for castings with either light or heavy sections.



For open mold casting, a flat reinforced platform having the same dimensions as the exterior of the flask to be used, is placed on the floor. The pattern is laid on this platform with the contours of the die or punch facing up. The flask is then placed on the platform to form a fence around the pattern. There should be at least 3 in. of space between the pattern and the nearest point of the flask, to prevent metal runouts.

Sand with as low a moisture content as possible is then sifted over the pattern. After the pattern is covered, additional sand is shoveled in and tamped down firmly. No provision for venting need be made except with very deep dies, in which case 1/16 or ⅛ in. vent wires are run down through the sand after the mold has been turned over, but before the pattern has been removed. The vent wires enter the sand near the flask and are pushed down on a plank until they touch the pattern. No fumes are produced by the alloy, but steam from the sand may cause rough spots in the bottom of a deep die if not vented.

After the mold has been completely rammed up, the sand is scraped off level with the top of the flask and a cover, called a "follow board," which is a duplicate of the platform on which the pattern rests, is laid on top of the flask. Clamps are used to fasten platform, flask and follow board firmly together and the mold is then turned over by a crane.

Having removed clamps and platforms, the flask is leveled in both directions by means of wooden wedges under cover cleats, and any loose sand brushed off the exposed bottom of the pattern. With a stick, the sand adjacent to the pattern is compacted and smoothed to a slight level. The pattern is then rapped lightly to free

it from the sand and withdraw as nearly vertically as possible by lifting bars. Any necessary patching is then done on the mold and particles of sand are removed by blowing or with the air suction pump previously described. The mold is then coated with talc as a skin dry before the pouring begins.

Gating the Casting

The casting is gated at one point only, except when there are two deep sections in the mold which are not connected by a channel through which the metal can flow to equalize the levels. Two gates are used in such a case and levels of metal kept approximately equal in both sections. Pouring directly into the cavity is considered hazardous because washing of the sand is likely to occur and splashes of the molten alloy may adhere to the surface of the mold and freeze. If this occurs, the rising level of the molten alloy is apt to float these splashes, lifting sand with them and causing a bump on the casting; or to float around them without remelting them, causing still more serious surface defects.

The use of various kinds of inserts is entirely practical in Kirksite "A" dies. Chills can be used where trouble is experienced with draw marks, although this is rarely necessary. Cast iron or steel draw ring beads can be anchored in place to improve wear resistance at local points in the die. Nuts or bolts can be cast in proper position to line up fastening holes in the press platens through the use of spiders or templates.

Handling and Pouring

In the principal handling method, which has proved satisfactory, baked sand cones form lifting pin holes into which bolts are cast as inserts. Holes are cut in the outer walls of the molds by means of tubing and lugs of the alloy formed to receive the lifting chains. Lifting the dies by wrapping a chain around them is very dangerous because of the hardness and oiliness of the casting.

With sand molds carefully prepared, the responsibility for a good casting depends upon the man in charge of melting and the man who pours the alloy. Either can spoil the casting very easily. The temperature of the alloy is increased to 900 deg. F. to offset temperature drop when the metal is transferred from the melting kettle to the pouring ladle. Increase to 900 deg. F. will also eliminate the danger of the metal temperature dropping below 775 deg. F. during pouring. Holding the alloy below 775 deg. F. causes segregation of copper-rich zinc compounds at the bottom of the kettle and a consequent loss of physical properties in the casting. Pouring in the foundry at 800 deg. F. at the ladle gives very satisfactory castings.

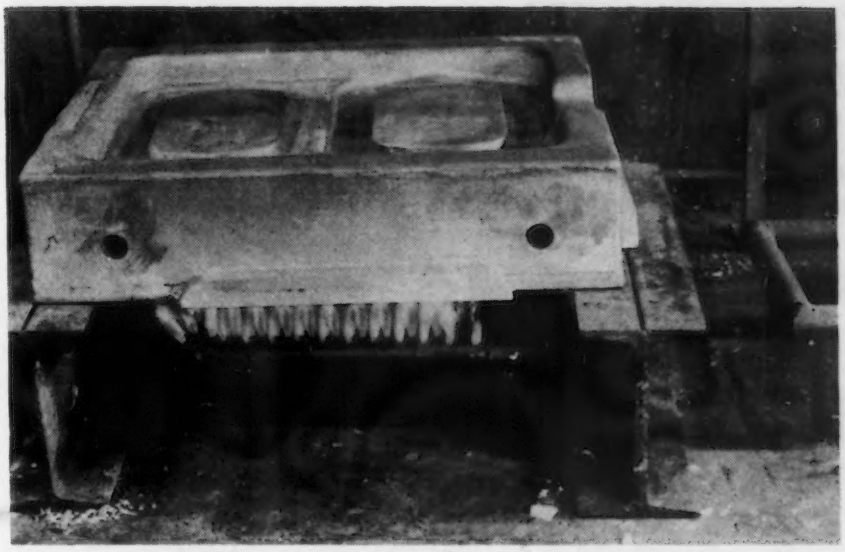


FIG. 5—Female Kirksite die being heated to about 300 deg. F., prior to pouring a lead punch.

It is also important to pour very slowly, with a stream of molten metal not more than ¾ in. in diameter. This rate of pouring permits production of two-ton dies free from cold shots or folds. The more slowly the metal is poured, the sounder will be the casting and the less will be distortion due to inequalities in rates of cooling (Fig. 2).

Gating the mold at the lowest possible point, and pouring slowly to within approximately ¾ in. of the top, gives the mold a fairly flat bottom. Distortion is minimized by covering the flask after the pouring with a sheet of ½ in. asbestos board to keep the surface from freezing and setting up strains tending to bow the casting. A light cut on the planer gives sufficient bearing surface after the mold has been removed from the flask and allowed to cool.

The finished casting will have at least 2 in. of the alloy above the highest point in the cavity and if the die

FIG. 6—Pouring of the lead in the Kirksite die is distributed over the whole area of the die.

has very heavy side walls, it may be necessary to keep the metal at the thinnest portion of the casting in a molten state with a torch until the side walls have solidified. If this is not done, migration of molten particles from the partially solidified light section will cause porosity at that point.

Punches

All that has been written on molding and castings up to this point applies equally to punches, dies and pressure rings or binders, provided each has a separate pattern from which a sand mold can be made. It is, however, often the practice to cast only the die or the punch from a pattern and to produce the mating members of the die-set from this casting.

If the die or female casting is chosen as the master, the punch can be made only of a material which is sufficiently ductile to flow under pressure in the press, to fill up the space between it and the die caused by its solidification shrinkage. Antimonial lead has proved sufficiently ductile for the purpose and yet hard enough to stand up for fairly long runs of light gage metal parts.

To produce these lead alloy punches, the die surface is fitted to templates and polished with an emery disk on a flexible shaft grinder. It is then heated to approximately 300 deg. F., which will expand the die to the metal thickness required (Fig. 5). A fence of boards is built around the die, extended a sufficient distance above the top of the die to give ample clearance between the die and the upper platen or head of the press, and braced by clamps to resist the pressure of the molten metal.

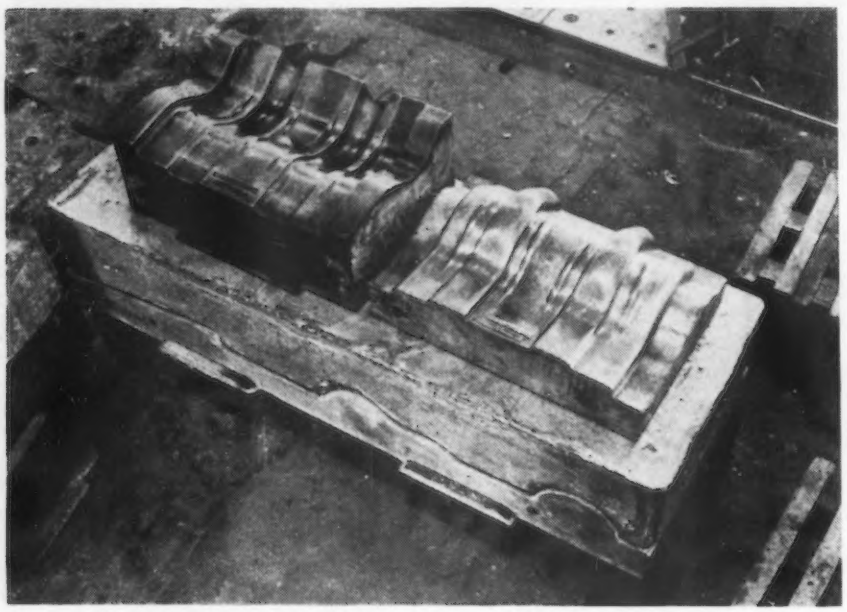


FIG. 7—Completed lead punch and die.

Fillets made of fire clay mixed with three parts lard oil and one part kerosene are applied to all interior corners to prevent run outs. After being sprayed with a solution of iron oxide and water to prevent the punch from sticking to the die, the cavity is filled with molten antimonial lead at a temperature of about 800 deg. F. Pouring is not concentrated in one spot, but distributed over the whole area of the die (Fig. 6). After the pouring is finished, bolts held in a spider are set in place to provide fastening facilities. Fig. 7 shows the completed punch and die.

In attempting to take full advantage of the beneficial effects of antimony, the danger point in brittleness may be reached. Sections of the flange of the punch or even of the punch itself may break away under the repeated impact stresses, and injure the operator of the hammer.

Much of the beneficial effect of antimony is achieved by a 5 per cent addition, giving a maximum of ductility as measured by elongation. In actual practice the foundry at North American has achieved the best results by using 5 per cent antimony. For use in forming presses which do not deliver such a sudden blow, it is safe to use harder punches.

Since the lead punch proves too soft and ductile for satisfactory use with the heavier gage aluminum alloys and for steel and Inconel, it is necessary to produce punches of Kirksite "A". With sufficient amount of protective coating over the die and the proper pouring technique, satisfactory results have been achieved through the same method used for casting lead punches.

Finishing the Dies

If the pattern and foundry work has been done well, little fitting is necessary to match the punch to the die and pressure ring. To produce perfect parts, it has been found advisable to polish the dies with a fine abrasive disk on a flexible shaft.

What little work is necessary on the dies can be best performed with a set of scrapers and various shaped burrs, bits and abrasive disks in a flexible shaft grinder. If necessary, Kirksite "A" may be sawed, drilled, milled and planed very rapidly.

In preparing the dies for try out, all emery dust, steel chips and dirt must be removed from the die set before the first stamping is made. If such material remains on the dies, the pressure of the press imbeds it in the surface of the dies and causes scratching of the sheet metal.

Tool Reclamation—A Correction

IN the article "Tool Engineers Show Draws Big Crowd," appearing in THE IRON AGE, April 1, p. 61, it was stated that the No. 16 alloy of the Euctectic Welding Alloys Co. has a melting point of 1300 deg. F. This is incorrect. The "binding temperature" of the alloy is 1300 deg. F., while the melting point is around 1775 deg. F.

By binding temperature is meant the temperature to which the parent metal (in this case the tool) is to be heated, locally only, to cause the alloy (melted down with a torch) to flow and bind on the heated surface. The higher melting point of the alloy is of little importance in torch work since the tool itself is heated only to the binding temperature.

In the report it is also stated that the alloy can be used for brazing tools which are subsequently heat treated at 2300 deg. F. The actual statement of the speaker was that with its ability to withstand higher temperatures, the No. 16 alloy has also been successfully used in brazing and hardening high speed steel simultaneously at 2300 deg. F. This must be done in a furnace with a reducing atmosphere.

Improving Fatigue Strength of Machine Parts

By J. O. ALMEN
Research Laboratories Division, General Motors Corp., Detroit

. . . Dramatic increase of fatigue strength by pre-stressing in compression a thin layer of a machine part through peen hammering, swaging, shot blasting or tumbling, or by pressure operations by balls or rollers has long been realized, but improved technique and theory have lately excited the industry. The author of this paper, presented a fortnight ago before the American Gear Manufacturers Association, is a prominent proponent of this method of greatly extending the life of machine elements, and herein brings theory and technique of this subject up to date.

WHILE great strides have been made in most phases of engineering and metallurgy, it is doubtful whether, in dynamically loaded parts, more net work is being obtained from metals today than was obtainable a generation ago. New fabrication techniques have made possible many design improvements, better bearing materials are available, lubricants have been improved, but the basic useful strength of structural materials remains unaltered.

Although no super-strength alloys have been discovered and no such discoveries seem to be imminent, there is much that can be done to increase materially the fatigue strength of many machine parts made from ordinary structural materials. This fatigue strengthening does not require changes in design or in material, and in fact it does not require processes that are fundamentally new or untried. It is merely the extension of processes that, on the whole, have long and honorable histories and the avoidance of processes and practices that are now known to reduce fatigue strength. The significance of these processes has only recently become clear through the introduction of new concepts of fatigue phenomena by which new avenues of reasoning are opened to us. These new concepts are: *Fatigue failures result only from tension stresses, never from compressive stresses, and any surface, no matter how smoothly finished, is a stress raiser.*

Fully 90 per cent of all fatigue failures occurring in service or during laboratory and road tests are traceable to design and production defects and only the remaining 10 per cent are primarily the responsibility of the metallurgist as defects in material, material specification, or heat treatment. While this ratio is not a measure of the quality of workmanship contributed by each department, there can be no doubt that the metallurgist has a better appreciation of his responsibility for fatigue failures than has the designer, the engineer, or the man in the production department.

Fatigue Vulnerability

The surface of repeatedly stressed specimens, no matter how perfectly they are finished, are much more vulnerable to fatigue than the deeper layers. It has long been appreciated that the vulnerability to fatigue increases as the surface roughness is increased, particularly if the roughness consists of sharp notches and more particularly if the notches are oriented at right angles to the principal stress.

The practice of carefully finishing fatigue test specimens and engine parts is, of course, a recognition of this vulnerability insofar as visible marks or scratches are concerned even down to assuring that the final polishing marks are parallel to the direction of the applied stress. These precautions are known to be effective in increasing the fatigue strength of the specimens and specimens finished in this manner have, therefore, come to be known as "par" bars. This name implies that fatigue specimens and machine parts approaching perfection in finish give the highest possible fatigue endurance for any particular material and that they accurately measure the ultimate fatigue properties of that material.

It can be shown, however, that the so-called "par" bars are not the best specimens but that influences akin to notches, so far as fatigue vulnerability is concerned, are retained by the "par" specimens. It seems that the specimen surface is highly vulnerable simply because it is a surface; that there is an extra hazard in the surface layer not shared by the deeper layers. This extra surface hazard may be due to sub-microscopic notch effects or to the fact that the surface is a discontinuity since the outer crystals are not supported on their outer faces. Whatever the reason for a surface vulnerability, the evidence of its existence is strong.

Fatigue Life Increased

The fatigue strength of the most carefully prepared specimen will be increased if a thin layer of the specimen is pre-stressed in compression by a peening operation such as peen hammering, swaging, shot blasting or tumbling or by pressure operations by balls or rollers. This increase in fatigue strength resulting from the surface layer being stressed in compression is clearly shown by the S-N curves, Fig. 1, which compare normally finished railway axles with

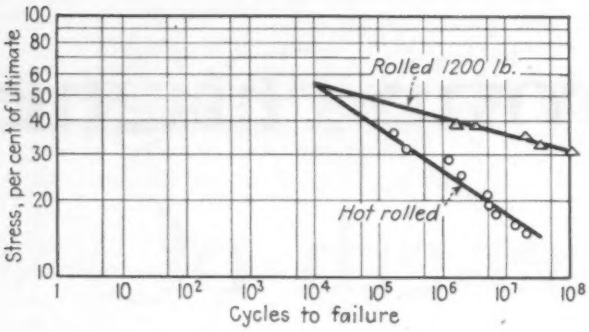


FIG. 1 — These S-N curves compare the fatigue strength of railway axles that have been normally finished with axles that have been subjected to a rolling operation. From this graph, it can be seen that a compressive stressed surface is effective in increased fatigue strength.

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axles that had been subjected to a rolling operation.[2] This and other tests show that the compressive stressed surface is effective in increasing the fatigue strength whether applied to highly finished specimens or to specimens having rough surfaces.

The bar chart, Fig. 2, records the increased fatigue durability resulting from a shot peening of a few typical machine parts. It will be seen that the fatigue durability is increased whether the parts are hard, such as carburized gears or soft as in steering gear parts; and whether the stress is completely reversed, as in crankshafts; or the stress range is small, as in preloaded springs.

It should be noted that the fatigue durability of peened axle shafts was not increased as much as most of the other specimens. The work on these shafts was conducted a number of years ago before the technique of peening machine parts had been developed and the relatively small increase was probably due to insufficient peening. Similar fatigue results have been obtained from a large variety of machine parts and from aluminum specimens and there are reasons to expect that the treatment is equally effective for all metals.

Fig. 2 shows the fatigue durability increase as per cent gain above the durability of the same machine part before peening. Actually, durability comparisons cannot be made on percentage basis alone as is apparent when examining the improvement in fatigue due to rolling as shown in Fig. 1. If, in this chart, the durability comparison is made at a load equal to 55 per cent of the ultimate strength, the percentage improvement is zero; if the durability comparison is made at a load corresponding to 20 per cent of the ultimate strength, the percentage improvement is infinite and, at intermediate loads, the percentage gain will, of course, be somewhere between these limits.

Why Peening is Effective

The most plausible explanation of the effectiveness of surface compression stress[3] is that when a load is applied to such specimens the tension stress in the surface layer is less by the amount of the compression prestress and since fatigue failure starts from tension stress the fatigue durability of the weak surface layer is increased. Although the tension stress in the material below the pre-stressed layer is not reduced but may be actually increased, the fatigue strength of the specimen is increased. It follows, therefore, that the lower layer is inherently stronger than the surface layer.

Foeppl[4] shows that the fracture in rolled specimens does not originate at the surface but in the material below the pre-stressed layer as would be expected if the surface is sufficiently pre-stressed in compression. Similar sub-surface fatigue failures usually called fissures and attributed to faulty material have long been known to occur in railroad rail in which the surface is stressed in compression as a result of the cold work of heavily loaded locomotive and car wheels.

Stress Patterns

Fig. 3 represents the residual stress pattern in an unloaded beam that has been rolled or peened, as has been described, in which C_3P and C'_3P' represent the magnitude of compressive pre-stresses and T_3A represents the magnitude of the tension pre-stress to balance the compressed stresses in the surface. After this beam has been loaded from either side through one stress cycle as in a reversed fatigue test the compression pre-stress will be reduced if the applied load raises the total compression stress above the yield point. The stress diagram for such a pre-stressed beam supporting an external load is shown in Fig. 4, in which the effective tension stress T_4 at the surface may be less than the stress T_5 below the surface in which case failure would start below the surface as noted by Foeppl. Note also that the neutral axis is displaced from the geometric center of the beam and that the tension stress T_5 below the surface is greater than in the beam that had not been pre-stressed as is shown by the dotted lines.

The magnitude of the sub-surface tension stress in a loaded beam having pre-stressed surfaces will vary with the amount of compression prestress and with the depth of the prestressed layer. The sub-surface tension stress may be greater for a deeply pre-stressed layer than for a layer of lesser depth.

It seems evident that the improvement in fatigue strength by compressive pre-stress is due to the reduction in tension stress when loaded in the vulnerable surface layer and that the increased compressive stress in a specimen stressed from zero to a maximum in either direction does no harm, probably because of adjustment of compression stress in the prestressed layer through yield.

Further evidence of the extra vulnerability of the surface layer is found in the behavior of specimens

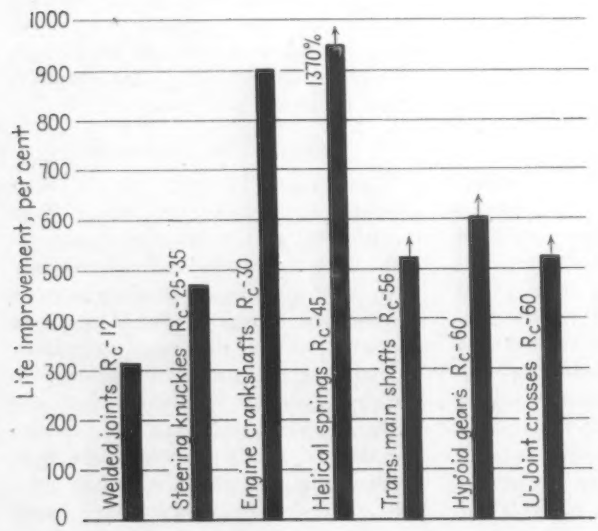

FIG. 2—The increased fatigue durability resulting from shot peening of a few machine parts are graphically illustrated. Fatigue durability is increased whether the parts are hard or soft.

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having increased strength in a thin surface layer as in thinly carburized or cyanided specimens or in thinly nitrided specimens. Fatigue failures in such specimens also start below the surface and show greater fatigue strength than the same material in the unclad state. A nitrided specimen is probably superior to the other forms of hard cladding because, in addition to the higher physical properties of the surface layer this layer is in a state of compression and has, therefore, less notch sensitivity.

While on the subject of beneficial internal stresses, mention should be made of surface compressive stress obtainable by heat treatment. By a rapid quench it is possible, through thermal contraction alone, to trap compressive stress in the surface and corresponding tension stress in the core, but this method, although showing some benefit in fatigue, is not so effective as the other methods that have been discussed. This subject will be discussed later in this paper.

Cold working of metals increases the hardness of most metals including steel at least in the range of low hardness. It usually results in internal stresses of varying degrees and patterns, it alters the physical properties and sometimes fractures the material. With the known sensitivity of materials to fatigue, it is obvious that the problem of controlling cold work must be solved just as has been done in the control of heat treatment in order to benefit by the good effects and overcome the evil. Cold working can be good or bad, depending upon how it is done and for what purpose.

Several instances are known in which the strength of machine parts and specimens have been decreased by too intense surface peening. The fatigue strength is increased as the intensity of peening or rolling is increased until a maximum improvement is obtained. With more intense peening, or rolling, the fatigue strength rapidly decreases below the original strength and the part will be damaged due to excessive internal tension stresses.

It would, therefore, seem important to control the compression stressed layer as to stress magnitude and depth with considerable accuracy by proper selection of the curvature of the rolling or peening instruments and by the pressure that is applied. The precise amount of surface compressive stress that is required for optimum fatigue strength is known for a few specimens only. It will vary with the shape and section thickness of the machine part, with the hardness and with the kind of metal being treated. For the present, it is necessary to frequently rely upon the not too accurate sense of proportion that is developed by experience to indicate the treatment that should be applied to any given machine part.

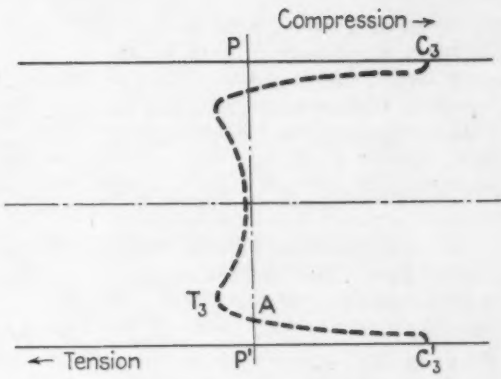

FIG. 3—Residual stress pattern in an unloaded beam that has been rolled and peened. C_3P and C'_3P' represent the magnitude of the compressive pre-stresses and T_3A stands for the magnitude of the tension pre-stress to balance the compressed stresses in the surface.

When the layer is stressed in compression (by applying sufficient pressure on the work by rollers or by peening) to a degree exceeding the yield strength of the metal in compression, the amount of residual stress is presumably at least equal to this yield strength.

The depth of the stressed layer is probably roughly proportional to the instantaneous area over which the pressure is applied, and to the pressure intensity. The depth of the compression stressed layer in a railroad rail[5] should be greater than the depth of the compression stressed layer in the same material if small rollers at the same pressure intensity were used instead of large car wheels. Under these circumstances, the initial point of fracture should appear at corresponding depths. Such evidence as is available indicates this to be true.

Overdose of Nitriding

Although the usual experience with nitriding is that it greatly improves fatigue strength, it is possible to overdo nitriding just as it is possible to overdo surface stressing by peening and rolling. The high compressive surface stress that results from nitriding must, of course, be balanced by internal tension stress of equal total value. When deep nitriding is applied to light sections the unit internal tension stress may reach dangerous proportions.

It is known that internally nitrided cylinder barrels are more prone to fail by cracking than cylinder barrels that are not nitrided, since the stress due to nitriding is added to the stress from gas pressure. Care must therefore be used in nitriding thin sections to gage the depth of the nitrided layer in proportion to thickness of the section being nitrided.

The carburized layer in a carburized part is stressed in compression as is graphically shown in Fig. 5. Two opposite faces of this half-inch square specimen were carburized while the other two faces were protected by copper plating. The specimen was quenched and tempered in the usual manner after which it was split with a saw as shown in Fig. 5. The parts are curved convex on the outer faces indicating compressive stress in these faces. Of interest here is the magnitude of the compressive stress in the carburized layer and the reduced compressive stress, possibly even tension stress, in a thin surface layer. When carburized parts

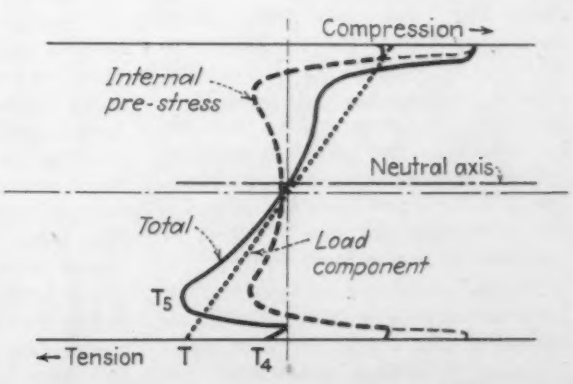

FIG. 4—Stress diagram for a pre-stressed beam supporting an external load in which the effective tension stress T_4 at the surface may be less than the stress T_5 below the surface.

such as bearing races, wrist pins and gear teeth are ground it may be expected that the surface will be stressed in tension as is indicated by the dotted lines shown at the right in Fig. 6.

The residual stress in crankshafts and other parts hardened by induction heating and probably also in flame hardened parts resembles the residual stress in carburized and hardened parts.

With internal stresses of the magnitude shown in Fig. 6 it can be readily understood why carburized parts are prone to warp during heat treatment especially if the design is not symmetrical with respect to the internal stresses.

Residual stresses due to quenching from relatively low temperatures may reach considerable magnitudes and may be harmful or helpful to fatigue durability depending upon whether the trapped stresses augment or diminish the tension stresses from the applied loads.

Corrosion Promotes Fatigue

Fatigue failures in many machine parts are traceable to corrosion of several kinds or to other forms of surface damage that occur in service. In normal machine parts even slight corrosion or bruising is very potent in encouraging fatigue fractures because each pit interrupts the continuity of the surface and increases the local stress. The damaging effect of corrosion or bruising is prevented on the surfaces that are adequately protected by compressive prestress because the local tension stress cannot become dangerously high until the pits or bruises have progressed sufficiently to penetrate the compressively stressed layer. This was forcefully demonstrated in fatigue tests of a machine part that failed alternately in a badly formed fillet or in the region of a clamp remote from the fillet where fretting corrosion occurred. The durability of the part could not be increased by improving the fillet because this would merely transfer all failures to the fretted area at about the same durability. After peening, however, the fatigue durability was found to have increased several hundred per cent and large additional gains were then possible by improving the form of the fillet without failure in the corroded area. The peening did not prevent corrosion but it did prevent the ill effect of corrosion in promoting fatigue.

Similar protection against the effects of corrosion and of surface bruises is afforded by nitriding,[7] carburizing and other treatments that produce compressively stressed surfaces. The working face of a gear tooth may be severely pitted, creating a fatigue hazard, but the bending fatigue strength may not be impaired because the carburized layer is compressively stressed and the surface is compressively stressed by the cold work of mating teeth.

Efforts to improve products by improving surface finish may sometimes have the opposite effect. Highly finished surfaces and fillets may lead to a false sense of security if, as the result of machining or straightening operations, the parts have high internal stresses of the wrong kind.

When machine polishing is done by the use of abrasive paper or cloth wheels, or abrasive covered felt wheels, sufficient heat is often generated to induce serious surface tension stresses and thus promote instead of prevent fatigue failures.

In ground surfaces such as shafts, wrist pins, and gear teeth, the grinding operations may introduce high surface tension stresses that from the standpoint of fatigue strength, often do more harm than good. The surface tension stresses from grinding are often so great as to produce visible or Magnaflux surface cracks but whether detectable or not, surface tension is frequently very serious.

Internal stresses of the wrong kind are perhaps the most insidious of all fatigue hazards because it is difficult to learn their magnitude or the pattern in which they are distributed within the material or whether they are alike for all commercially identical machine parts. Internal stresses may be the result of operating conditions such as occur in brake drums, clutch plates, or other friction surfaces where the instantaneous temperature in a thin layer is so great that, under thermal expansion, the surface layer is stressed beyond the yield point in compression. When the source of heat is removed, the heated surface layer is quenched by the adjacent cool metal and, under thermal contraction, it is so severely stressed in tension that fractures often occur. This is, of course, the same thing that happens in machine polishing and in grinding unless great care is used.

Internal stresses often result from the cooling of castings and forgings or from the vigorous heat transfer of heat treating. Many parts, such as crankshafts, axle shafts and camshafts require straightening during processing. Since the straightening operation is usually done at room temperature and since the part is rarely stress relieved after straightening, the result is severe internal stresses.

A—Before Splitting

B—After Splitting

FIG. 5—The upper and lower faces of this part are carburized and hardened, and are stressed in compression The specimen was split with a saw. The parts are curved convex on the outer face, indicating compressive stress in these faces.

Elasticity of Materials

A common cause of fatigue vulnerability is the belief apparently held by many designers and engineers that structural materials are rigid. Many fatigue failures can be traced to elastic deflection for which no allowance was made in the design. Elastic deformation of mating parts may be such as to concentrate the load in a small region as often occurs under operating conditions.

Under operating conditions a crankshaft may be so elastically deformed in twisting and in bending that the bearings are only partially effective in supporting the load. The bearings are frequently found to be plastically deformed or worn "bell mouthed" to accommodate the elastic gyrations of the crankshaft.

Perhaps the most generally misunderstood of all machine elements are the several classifications of gears. As ordinarily designed there is only one thing certain about gears and that is that they will not function as intended by the designer. When laying out a set of gears on the drafting board the mating gear teeth are represented by parallel straight lines over which the load is assumed to be uniformally distributed but no matter how carefully the gears are cut and heat treated the mating teeth will never again be parallel except by accident and then only through a small load range.

The nature of the contact between two mating gear teeth is influenced: (1) By the elastic characteristics of

the housing in which they are contained; (2) by the elastic characteristics of bearings by which they are supported; (3) by the elastic characteristics of the shafts upon which they are mounted; (4) by the elastic characteristics of the gears themselves; (5) by the accumulated dimensional errors in all the supporting parts as well as the errors in the cutting of the gears; (6) by the necessary and accidental clearances in the supporting parts; (7) by misalinement of supporting parts through thermal expansion; (8) by the amount and nature of warpage in heat treating to give the metallurgist some of the responsibility.

The result of all this is that it is virtually impossible that the parallelism between mating teeth as visioned by the designer can exist in practice. If it should chance that two mating gear teeth are parallel at some load they cannot be parallel at any other load because the elastic deflection of some of the supporting parts are not linear with respect to the load. As ordinarily designed the load on gear teeth is never uniformly distributed over the length of the teeth but is always concentrated toward one end.

In the case of fatigue failure of mating helical gear teeth of equal strength, fatigue will always occur in the tooth that is loaded on its acute angled end because the section is weaker at this end. Mating helical gears should be offset so that contact cannot occur on the acute angled end by any mode of deflection. This is possible only where the torque is constant in direction.*

All gear teeth should be designed to afford a degree of tolerance for deflections, machining errors and warpage as has long been standard practice in spiral bevel,* hypoid and in some spur and helical gears. In "rigidly" mounted gears, this is accomplished by curving the tooth barrel shape or equivalent in such a manner as to concentrate the load near the centerline of the gear width and thus avoid load concentration at the weaker extreme ends of the teeth.

Load concentrations at the ends of gear teeth can sometimes be avoided by increasing the elastic deflection as is done in simple spur reduction gears by providing the gear with a thin diaphragm web located control of the gear width or by more complex construction in other forms of gears but it cannot be done by accurate dimensions alone.

Gear Tooth Pitting

The pitting of gear teeth is a form of fatigue that is induced by tensile stress from compression loads on the contacting tooth surfaces. The magnitude of the compression stress varies with relative curvature of the contacting teeth in accordance with the Hertz formula, it varies with the degree of load concentration at the ends of the teeth and with the applied load. The load that may be carried varies with the hardness and therefore with the strength of the material, with the temperature and with the manner in which the lubricant is applied.

The design factors that are effective in reducing the load concentration at the ends of the teeth such as barrel shaping or some equivalent, also reduce the contact compressive stress. The relative curvature and, therefore, the contact compressive stress can be varied by the choice of pressure angle. In general, there is little to be gained by designing wide face gears except the doubtful satisfaction of dealing with smaller stress numbers.

In high speed gears, pitting may occur when gears are transmitting no load. This is sometimes seen in the reverse idler gear of the automobile transmission. Although this form of transmission trouble is rare and occurs only when other conditions such as hardness are unfavorable, it serves to emphasize the part played by the lubricant in promoting fatigue. A reverse idler running submerged in oil will trap the oil between the gear teeth and if the clearances are small will induce extremely high surface pressures. We are all familiar with the high temperatures that are generated in gear boxes when too generously supplied with oil, but we do not always interpret this as a fatigue hazard. High speed gears should be lubricated by jets of low viscosity oil directed at the teeth as they are coming out of mesh, not on the incoming side. This form of lubrication will wash away the heat of friction while it is still on the surfaces of the teeth and will prevent excess oil from reaching the contacting teeth providing, of course, that the sump is dry.

Many materials and processes have been graded and are still being graded by laboratory tests which are now known to have been very costly to industry. For example, the fiction that a carburized part should have a hard case to resist wear, and tough core to resist breakage, arose from laboratory impact tests. In these tests the strength of the part was judged by the number or intensity of hammer blows it would withstand before fracture. Since gear teeth resisted impact fracture in accordance with the physical properties of the core, it seemed logical to specify heat treatments to bring out the best compromise between the imagined requirements of the case and the core. Being compromises, these heat treatments were not the best for either region.

If, instead of counting the number of impacts or measuring the intensity of hammer blows to produce fracture, the gear tooth had been examined after the first impact, the tooth would have been found bent and, therefore, ruined, and it would make no difference how many more blows were required to fracture the tooth.

This compromise heat treatment resulted in reducing the quality of many

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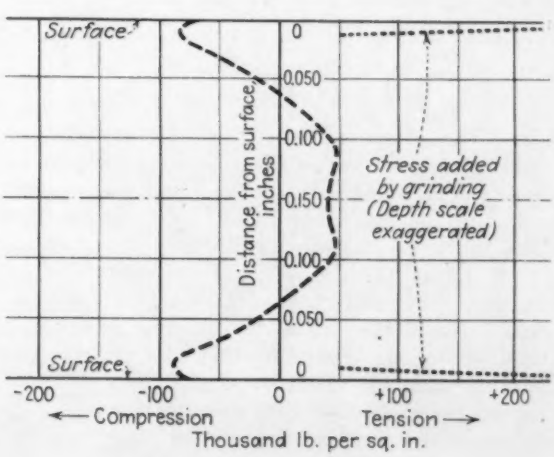

FIG. 6—The magnitude of internal stresses due to carburization and hardening.

Testing with X-Ray

IT has been known for many years that there are three ways of proving the presence of X-rays or gamma-rays—by photography, sensitized fluorescent screens, and by Geiger Mueller tubes. The higher sensitivity toward radiation of the Geiger-Mueller counting tube permits quantitative intensity measurements.

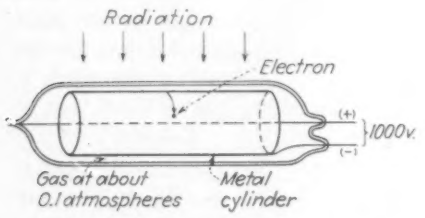

FIG. 1—Schematic design of a Geiger Mueller counting tube.

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Thus accurate wall thickness determinations are entirely feasible where film or screen testing would show merely local differences. Also the counting tube can work automatically, eliminating the human element in testing.

Some possible applications for the improved Geiger-Mueller counting tube in industrial testing are given in a German journal, "*TZ für Praktische Metallbearbeitung*," August, 1942. Fig. 1 illustrates the principle of the Geiger-Mueller tube as designed in 1928. A brass cylinder acts as cathode while a wire is arranged in its center and serves as anode. These electrodes are enclosed in a glass filled with gas at about 0.1 atmospheric pressure. If a radiation rich in energy impinges upon the metal cylinder, electrons are released, travel to the anode wire and discharge their electrical load. The gas discharges which occur in the mean unit of time can be counted by a mechanical counting device. The first rather delicate counting tubes have been improved by the introduction of a gas atmosphere; water vapor additions were pronounced especially suitable. (A. Trost. Zs. Physik, 1937, p. 399). A suitable method of registering the impulses was also developed by which the intensity of the radiation was shown directly on a milliampere meter. (A. Trost, Zs. Physik, 1941, p. 257). The sensitivity of the apparatus can be adjusted within wide limits to all practical radiation intensities. High intensities permit accurate and rapid determination, lower radiation intensities need correspondingly longer measuring periods. The radiation intensity is either read off the milliampere meter or recorded automatically.

Practical experience has shown that the counting tube and the film of fluorescent screen complement each other. The demarcation of the proper sphere of these various techniques depends largely on the size of the defects to be investigated. A film offers a plurality of qualitative local measurements and therefore small

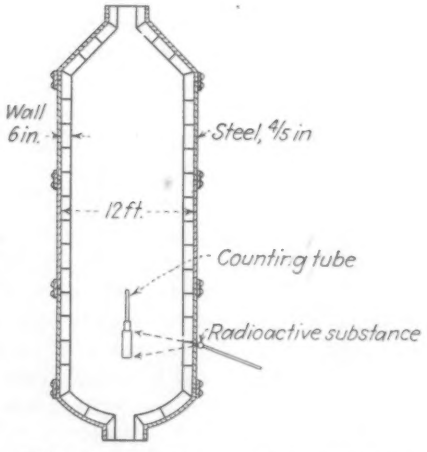

FIG. 2—Arrangement for measurement of wall thickness of a steel gas cylinder

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defects such as cracks, pores, or slag lines can be found easily. The counting tube, on the other hand, reproduces only one measured value which is in terms of numbers the mean radiation intensity across the whole field, given by the size of the counting tube or by the counting tube diaphragm opening. Defects extending across the whole field can, of course, be measured very accurately in a quantitative manner, but those which are small in comparison to the field naturally have only a limited influence upon the mean radiation value and are therefore registered either only to a limited extent or not at all. Generally, the field should not be smaller than 1 sq. cm. to make the investigation of large areas economically possible. This means that film and fluorescent screen remain important as far as the investigation of small defects is concerned. But the counting tube is well suited for the investigation of defects which extend over large areas, such as differences in wall strength, corrosion phenomena, inclusions, porous areas, and heterogeneities.

Measurement of the wall strength of gas cylinders, pressure vessels, etc., in which mechanical measuring devices cannot be used, is greatly facilitated by this new testing method. The gas cylinder is placed upon a special mounting which permits the helical advance of the cylinder between counting tube and X-ray tube (Fig. 2). Here the counting tube is inserted through the neck of the cylinder into the interior of the tube, the X-ray tube being placed as close as possible to the container wall and the radiation intensity being measured while the cylinder travels slowly past the test setup. Any variations in thickness will reflect in the curve which is drawn from the current strength. The milliampere meter can be calibrated against sheets of known thickness and against X-ray tubes of known potential. Steel thicknesses up

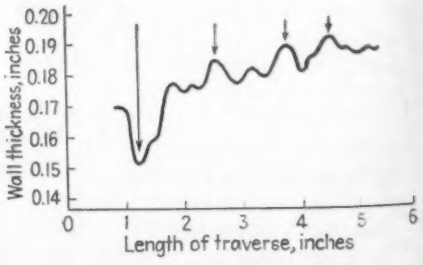

FIG. 3—This curve, registered in 2 sec. shows within 1 per cent accuracy corrosion measurement on a steel gas cylinder wall. An X-ray photo of the wall, which appeared in the German journal, shows remarkable agreement with the ampere meter curve.

Counting Tubes

. . . An outline of recent German developments in quantitative intensity measurements by counting tubes shows usefulness of this method in detecting corrosion, blow holes and inclusions.

to about 2 in. can be measured with an accuracy of 0.5 per cent, using a measuring area of 2 sq. cm. and a measuring time of 1/10 second. Percentage accuracy is largely independent of wall thickness, but when greater than 2 in., the measured area must either be decreased or the time of measuring increased to retain accuracy. Using an X-ray tube emitting soft radiation and specially

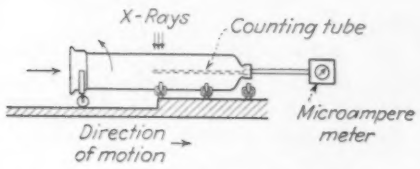

FIG. 4—Counting tube arrangement for testing lined chemical equipment. Photographs of areas suspected of corrosion, as published in the German journal, coincided to a remarkable degree with the counting tube findings.

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adapted counting tubes, lead, tin, copper, brass, or steel foils of only 0.0004 in. thickness can be measured with an accuracy of 1 per cent. Even aluminum foils of 0.004 in. thickness can be measured to an accuracy of 2.5 per cent. Lower limits are given by the window of the X-ray tube available and by the counting tubes.

Corrosion defects, also, can be determined by wall thickness measurements. It is advisable to restrict the measured area somewhat, for instance to 0.2 in. diameter. Corrosive defects are usually only local, but they cause considerable local variations, whereas wall thickness differences occasioned by faults in the manufacture usually extend over larger areas. Fig. 3 shows the results of the investigations made by counting tube on a corroded steel gas cylinder wall. The curve shown was registered in 2 sec. and represents an accuracy within 1 per cent. A cylinder of 8 in. dia. can be checked in 5 min., turning the cylinder 20 times while slowly advancing it.

The counting tubes process is of special importance in the testing of lined chemical equipment, such as retorts. In order to check the progress of corrosion in such apparatus, usually the lining must be removed and, after checking, refitted. A new testing arrangement is shown in Fig. 4. Here a large and particularly sensitive counting tube is used and suspended in the center of the vessel. A strongly radioactive substance emitting gamma-rays is passed along the seams of the vessel and along any other especially endangered areas.

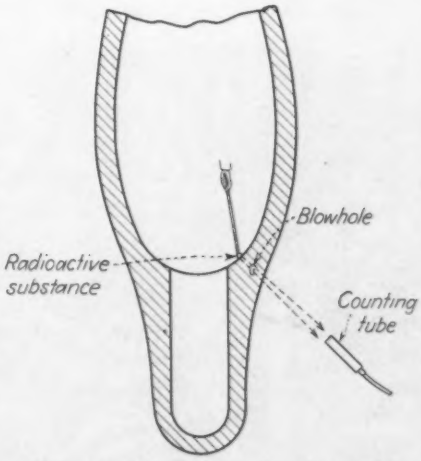

FIG. 5—Arrangement for the testing of cast steel retorts for blowholes and inclusions.

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Thickness differences of about 0.04 in. can be found in the steel. Suspected areas were marked on the outside of the vessel and after the removal of the lining, corrosion phenomena were discovered agreeing remarkably with the measurement indications. The accuracy was particularly evident where the corrosive attack assumed the character of deep furrows.

The possibility of testing thick-walled castings for inclusions or pipe is of importance. Here, also, radioactive substances are used, and irrespective of the thickness of the material an accuracy within 0.04 in. of steel can be obtained, and the spatial extent of an inclusion can be calculated accurately. In practice, the determination of defects depends on the available quantity of radiation, that is, on this thickness of the material, the rate of measuring, and the strength of the radioactive substance. Thicknesses up to 10 in. of steel can be measured with 100 mg. of mesothorium using direct intensity measurements.

It is important in testing for inclusions to pay special attention to any points where cross-sectional changes occur. These areas can be tested quickly by passing over the surface of the casting with the preparation and observing directly the readings of the milliampere meter. Blow holes or inclusions of ½ in. size and larger can be found very rapidly. Fig. 5 shows diagramatically the determination of such cross-sectional areas on a cast steel retort and Fig. 6 shows a graph indicating the extent of a large blow hole, plotted against the wall thickness. For such work, large counting tubes are advisable and sometimes seven counting systems are united in order to increase the sensitivity of the tube.

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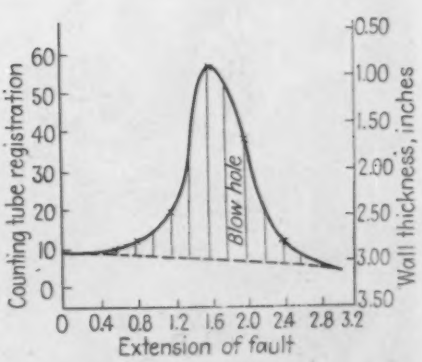

FIG. 6—Graph showing the extent of a large blowhole, plotted against the wall thickness of the casting.

Spot Welding Alumin

THIS report covers the results of research conducted for the purpose of developing production process specifications for the spot welding of annealed aluminized steel. This material has come into the limelight recently as a substitute for critical stainless steel in aircraft construction.

Before starting this investigation on the spot welding of aluminized steel, drawings were examined in order to determine the types and gages of material to which the aluminized steel would be spot welded. It was found that the drawings called for 0.018 and 0.024 in. aluminized steel, and 0.018 and 0.025 in. AISI type 302 stainless steel (annealed and ¼ H), in locations which would be spot welded to the aluminized steel. Also, stainless steel anchor nuts were required to be spot welded to aluminized steel. However, in order to make the investigation more complete and usable, the spot welding of the following combinations of materials was studied:

(1) 0.018 in. aluminized steel—0.018 in. aluminized steel.

(2) 0.018 in. aluminized steel—0.024 in. aluminized steel.

(3) 0.024 in. aluminized steel—0.021 in. aluminized steel.

(4) 0.018 in. aluminized steel—0.018, 0.024 and 0.037 in. 302-1A stainless steel.

(5) 0.024 in. aluminized steel—0.018, 0.024 and 0.037 in. 302-1A stainless steel.

(6) 0.018 in. aluminized steel—0.018, 0.024 and 0.035 in. mild steel.

(7) 0.024 in. aluminized steel—0.018, 0.024 and 0.035 in. mild steel.

(8) 0.018 and 0.024 in. aluminized steel—stainless steel and cadmium plated anchor nuts.

Quarter hard stainless steel was not tested, but it is believed that results would be similar to those obtained with the annealed stainless steel.

A 250-kva a.c. rocker-arm type spot welding machine was used for the tests. However, it is believed that the information obtained can be read-

um-Clad Steel

By JOHN D. ROSENBLATT
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Lockheed Aircraft Corp., Burbank, Cal.

. . . Laboratory tests show that spot weld shear strengths well above the Army minimum for annealed SAE 1010 steel can be obtained for aluminized steel, used as a substitute for the more critical stainless steel in aircraft construction. Projection welding of stainless steel and cadmium plated anchor nuts to aluminized steel is also feasible with certain modifications.

ily applied to other makes and types of machines.

The research was conducted in a manner to obtain information on the following aspects of the welding problem:

1. Preparation (cleaning and etching) of the material prior to welding.
2. Electrode tips (size, shape, maintenance).
3. Welding machine settings.
4. Weld strength and consistency.

Results of Tests

An analysis of the test results showed that spot weld shear strengths well above the Army minimum for annealed SAE 1010 steel could be obtained with the two gages of aluminized steel for all the combinations listed above. The shear strength consistency was good in all cases. A large number of welds, more than 100, could be made without cleaning the electrode tips, and standard tips for spot welding steel could be used.

It was not feasible to weld stainless steel and cadmium plated mild steel anchor nuts to the aluminized steel in the ordinary manner; that is, with two small diameter, domed electrodes. Excessive flashing, burning and cracking of the nuts, rapid tip deterioration, tip sticking and inconsistent welds were obtained. However, projection welding of the nuts was satisfactory, except in the case of cadmium plated nuts to 0.024 in. aluminized steel. An alteration of the projections would probably improve the results.

As a result of these tests, the following shop procedures were worked out as outlined below:

Cleaning Preparation

It is necessary to remove the discoloration and film, perhaps caused by corrosion, which appeared on large areas of the aluminized steel sheets. Flashing is reduced, the danger of burning a hole in the material is prevented and consistency is improved if the surfaces of the material are clean and bright. The following alternate procedures have proved satisfactory:

A. Clean in hot soap solution. Etch in 3 per cent hydrofluoric acid for 3 min. Sponge off loosely adhering film which remains. Dry. Weld.

B. Wire brush surfaces of material. Weld.

Any satisfactory method of cleaning and etching Alclad aluminum alloy for spot welding will also probably be satisfactory for aluminized steel, provided the surfaces of the latter are made clean and bright.

When aluminized steel is welded to either stainless or mild steel, the surfaces of the latter should be reasonably free from grease, dirt, markings, etc.

Electrode Tips

Electrode tips of high strength copper alloy, such as Elkaloy A or Mallory 3, of sizes and shapes currently in use for welding steel, are satisfactory. One tip should be 3/16 in. diameter and 3 in. radius; the other, ⅝ in. diameter and 10 in. radius.

When aluminized steel is welded to either stainless steel or mild steel, it is recommended that the small diameter, 3 in. radius tip bear against the aluminized steel. However, this is mandatory only in the cases of 0.035 in. mild steel, and 0.025 and 0.037 in. stainless steel, and is necessary in order to prevent excessive flashing between sheets and on the surface of the non-clad materials.

It is possible to make more than 100 welds in aluminized steel without cleaning the electrode tips. In fact, better results are obtained when the tips have picked up aluminum (which occurs after the first few welds) and are allowed to remain in this condition. The tips should be dressed *only* to maintain their size and contour.

TABLE I
Recommended Electrode Force

Material Combination	Electrode Force Lb.
0.018 Al to 0.018 Al	625– 700
0.018 Al to 0.024 Al	625– 700
0.018 Al to 0.018 mild steel	625– 700
0.018 Al to 0.024 mild steel	625– 700
0.018 Al to 0.035 mild steel	625– 700
0.018 Al to 0.018 stainless steel	950–1000
0.018 Al to 0.024 stainless steel	950–1000
0.018 Al to 0.037 stainless steel	950–1000
0.024 Al to 0.024 Al	625– 700
0.024 Al to 0.018 mild steel	625– 700
0.024 Al to 0.024 mild steel	625– 700
0.024 Al to 0.035 mild steel	625– 700
0.024 Al to 0.018 stainless steel	950–1000
0.024 Al to 0.024 stainless steel	950–1000
0.024 Al to 0.037 stainless steel	950–1000

Welding Machine Settings

The a.c. type of spot welding machine of not less than 100 kva. rating (R.W.M.A.) is recommended for the welding of this material in the gages covered. It should be equipped with an electronic type of control for accurate timing.

Since the welding machine settings will be different for each machine, and since specific settings cannot be transferred from machine to machine because of lack of calibration of control dials to absolute values, the following set-up procedure is recommended:

A. Adjust the current duration to 2 cycles. A longer duration increases flashing and spitting, and tip indentation.

B. Adjust squeeze time and hold time to values that give the desired rate of welding. The value of these quantities does not seem to affect the welds themselves.

C. Adjust the electrode force to values given in Table I for the particular combination being welded.

D. Adjust the transformer tap setting and the heat control dial for a low value of current. Make 25 or 30 welds in scrap material, then increase the current until excessive flashing and spitting occurs. Then reduce the current gradually (heat dial) until spitting stops. Even this current setting will be unusually

high when compared to mild steel. Check welds on test strips and with shear test specimens.

It is necessary to obtain machine settings with "dirty" tips, since welding will be done with the tips in this condition, and different results are obtained with clean tips.

Keep Weld Strengths High

In order to obtain good shear strength consistency and good weld slug penetration, it is necessary that the weld strengths be kept very high. This cannot be too highly stressed. The welds should be much larger than usually made in stainless or bare mild steel. Therefore, the shear strengths shown in Table II are recommended as minimum shop set-up values, even though in some cases they may be 1½ times the Army minimum for the same gage annealed SAE 1010 steel. These values are based on the averages obtained from at least 100 single-spot shear specimens made without cleaning the electrode tips, and should be readily obtainable in production practice. The high and low values of shear strength are also given in order to show the range that may be expected during a production run.

Some pitting and flashing may be unavoidable with certain combinations of aluminized steel and other materials due to the low melting point of the aluminum coating compared to that of the steel base. The aluminum on the faying surfaces of the sheets always melts. The electrode contact areas have a "burned" appearance, and the periphery of these areas appears rough and jagged. The globules of accumulated aluminum do not seem able to injure anyone handling the welded parts, even when quite heavy pressure is applied.

Spot Welding of Anchor Nuts

The spot welding of stainless steel and cadmium plated mild steel anchor nuts to aluminized steel sheet using two small diameter domed electrode tips, or one flat and one domed tip, results in excessive flashing and spitting, burning and cracking of the nuts, rapid tip deterioration, tip sticking and inconsistent welds. Furthermore, the welds obtained are very large, which is undesirable from the replacement standpoint. This is due to the fact that large currents are required to weld the aluminized steel, and since the thickness of the ears of the nuts is 0.062 in. (very thick compared to the 0.018 and 0.024 in. aluminized steel), the ears of the nuts overheat. However, welds can be made if the unfavorable conditions described above are acceptable.

Stainless steel anchor nuts with projections as developed at Lockheed and adopted by the Elastic Stop Nut Co. can be welded very satisfactorily to aluminized steel with an a.c. rocker arm type machine, using two large diameter (½ or ⅝ in.) flat tips and very low electrode force, and welding one projection at a time. Both welds can be made at the same time with a press type spotwelding machine if the arms are rigid enough to maintain electrode alinement, or with a projection welding machine. Even better results are obtained if the projections are altered slightly by reducing penetration of the punch which makes them from the present specified 0.041 in. to 0.032 in. The weld shear strength is between 400 and 500 lb.

Cadmium plated mild steel anchor nuts with projections as currently formed by the Elastic Stop Nut Co. were welded satisfactorily with an electromagnetic type stored energy machine. Difficulty was experienced with the a.c. rocker arm type machine, and is attributed to the fact that the projections are slightly smaller than determined most satisfactory in previous experiments.

More research work is contemplated on spot welding of cadmium plated nuts.

TABLE II
Recommended Shop Set-Up Values, Single-Spot Shear Strength

Material Combination	Recommended Shop Set-Up Value, Lb.	Expected Range of Shear Strengths, Lb.	
		Max.	Min.
0.018 Al to 0.018 Al	500	550	450
0.018 Al to 0.024 Al	550	575	500
0.018 Al to 0.018 mild steel	425	450	400
0.018 Al to 0.024 mild steel	525	550	475
0.018 Al to 0.035 mild steel	525	550	425
0.018 Al to 0.018 stainless steel	525	550	475
0.018 Al to 0.024 stainless steel	525	550	475
0.018 Al to 0.037 stainless steel	500	525	450
0.024 Al to 0.024 Al	750	775	675
0.024 Al to 0.018 mild steel	425	475	375
0.024 Al to 0.024 mild steel	650	675	600
0.024 Al to 0.035 mild steel	725	775	625
0.024 Al to 0.018 stainless steel	700	750	600
0.024 Al to 0.024 stainless steel	725	775	650
0.024 Al to 0.037 stainless steel	700	750	675

Reclamation of Porous Castings

IN THE IRON AGE, April 8, p. 52, the reclamation of porous castings with Bakelite compounds was described. Additional comments on this technique appeared recently in the British *Foundry Trade Journal*, in the form of a letter from J. W. Athey, managing director of Fordath Engineering Co. Ltd. This letter stated:

"I was interested to read the paper given by Mr. Bowman on bakelite plastics for overcoming porosity in metal castings, and would like to add my own experience in this direction.

"As far back as 20 years ago, I made a solution of bakelite, technically called Bakelite NPA cement, and methylated spirits, with the addition of 5 per cent acetone. This produced a clear homogeneous brown liquid which was used as directed for overcoming porosity in metal castings.

"It was thought that the solution of bakelite in spirit would have a much greater penetrating effect in the microscopic pores of metal than would be possible in denser liquids, as the spirit would evaporate rapidly and leave the deposit of bakelite behind. It was recommended that the casting should be first of all thoroughly dried by heat so as to drive off any moisture which might be present. From reports received it was found that this solution was, at any rate in some cases, quite effective, valuable castings being saved from the scrap heap through it use."

MAGNESITE REFRACTORIES

By J. H. CHESTERS
Central Research Department, United Steel Companies, Ltd., Stocksbridge, England

. . . The author concludes his study with a discussion of the manufacture, properties, specifications and applications of magnesite brick. Last week he investigated sources of refractory magnesite and the influence of firing treatment on its properties, as well as the behavior of binary and ternary magnesia systems.

THE high refractoriness of magnesia has been known for a long time, but it was not until 1880 that the Veitsch Co. made the first serious start at magnesite brick making at its works in Styria, Austria. For a long while Austria was the principal source of magnesite brick but in more recent times such brick have been made all over the world and from a great variety of raw materials.

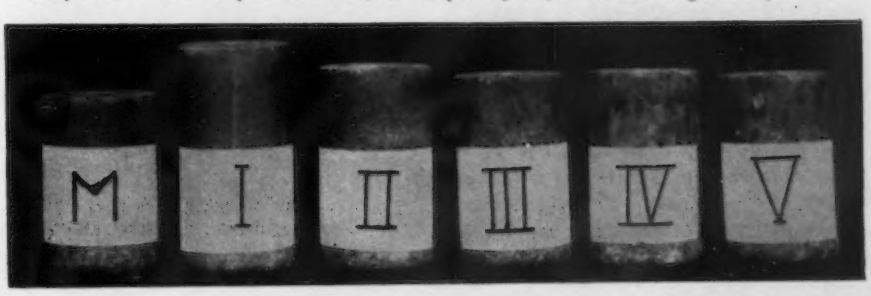
The grinding of magnesite for brick production is done in one of two principal ways: Pan mill grinding in which a continuous grading is obtained; and a combination of hammer mill, cone crusher and ball mill grinding whereby a coarse and a fine fraction (or sometimes three fractions) are obtained, which are subsequently re-combined to give the desired grain size distribution.

The importance of grading is brought out very clearly by Fig. 8 which shows a series of test pieces, each made from the same weight of electrically fused magnesia mixed with gum and water and molded under a given molding pressure. It will be seen that even apart from the test piece M which was made under a somewhat higher pressure, there is a considerable variation in height of test piece. The unfired porosity of test piece (1) was 37.0 per cent whereas that of test pieces (4) and (5) which were made with dense packings of the 70-0-30 and 70-10-20 coarse-medium-fine type gradings, were 24.5 and 22.5 per cent respectively. The grading was also found to have a marked effect on the firing shrinkage, it being generally true that brick having a high unfired porosity or a small average grain size, show a high firing shrinkage. In general, the object is to obtain a dense brick, and this is particularly true of brick for use in open hearth bottoms or hot metal (iron) mixers, but for certain purposes, for example, roofs of arc furnaces, a more porous brick may offer advantages, such as a lower capillary action on absorbed fluxes.

Magnesite brick are usually made by mixing the graded clinker with water or a dilute solution of sulphite lye. For special brick, additions are, however, sometimes made. Thus, iron oxide may be added to produce additional sintering and density of texture, while 2 to 6 per cent of alumina may be added to improve the thermal shock resistance. Larger additions. for example, of chrome ore, are also employed, but these lead to a field of binary refractories which will be discussed in a later section.

For a long while the souring, that is, the mixing of clinker or brick batch with water and allowing it to stand, was considered one of the great secrets of magnesite brick manufacture. Given well-burned magnesite containing negligible amounts of free lime, this procedure is no longer necessary. The clinker is simply ground, mixed with water (about 5 per cent) and pressed. Within a few minutes it is entering the drier in the form of unfired brick. Where, however, the magnesia contains either a proportion of soft fired material or a serious content of free lime such as may occur through the presence of dolomitic particles in the raw material, souring in some form becomes a necessity. Two main ways are employed: Wetting of the clinker or brick batch and allowing it to stand, either on a cold or a hot floor; and the treatment of the material in closed drums with steam, autoclaving. Both these processes result in the hydration of the fine grains and of the more reactive material. The lime present is not removed, but is converted into the hy-

FIG. 8—Magnesite test pieces, showing influence of grading on the bulk density. All the test pieces were of the same weight and were molded under similar pressure, except M, which was pressed at 56,000 lb. per sq. in., a somewhat greater pressure.



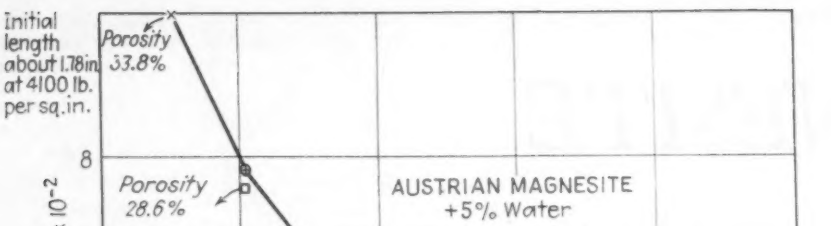


FIG. 9—Effect of molding pressure on the porosity of magnesite test pieces.

droxide which greatly reduces the chance of cracking occurring during subsequent drying of the processed brick. If the batch is allowed to stand in the open air it will be found that a considerable proportion of the hydroxide formed becomes converted to the carbonate or basic carbonate.

Molding and Firing

It is now generally accepted that a hydraulic, mechanical or hammer type press capable of giving a load equivalent to about 10,000 lb. per sq. in. is necessary for the production of dense magnesite brick. This is, however, a comparatively recent development, the brick having been formerly made either by hand molding or by light mechanical pressure. The remarkable effect of molding pressure on the size, and hence the porosity of test pieces made from Austrian magnesite, is illustrated in Fig. 9. It will be seen that the porosity of this particular test piece when made under 4,000 lb. pressure, was 33.8 per cent, whereas an increase in the pressure of 8,000 lb. per sq. in. reduced it to 28.6 per cent. As the pressure increases the rate at which the porosity decreases becomes less. Hence, although presses yielding much greater loads could be constructed, it is doubtful whether the improvement in the product would justify the additional expenditure required. It will be seen from the data in Table III that the porosity of the fired brick is also affected (while the firing shrinkage is considerably reduced) by the employment of more powerful moulding pressures.

Work carried out by Dr. Weyl and the author, at the Kaiser Wilhelm Institut für Silicatforschung showed that the cracking of magnesite brick in driers was in general due to one of three principal factors as follows:

The use of soft fired magnesite; the presence of an excessive amount of fine material which hydrates rapidly and causes considerable expansion; too high a temperature in the drier.

The importance of the last consideration is shown by the extraordinary rate of increase of expansion with rising temperature. Thus a brick which may be dried with comparatively little expansion at 100 deg. F. may expand rapidly if dried at 140 deg. F. and crumble completely.

With large shapes the problem is accentuated as the drying time increases and it is particularly difficult to dry the inside of the brick at the same rate as the exterior. If the skin dries first, and the inside continues to hydrate and expand, then cracking of the block in the manner illustrated in Fig. 10, will occur.

Even if the strain set up in drying magnesite brick is not sufficient to show visible cracks, it may nevertheless lead to cracking in the kiln and hence it should not be assumed that kiln cracks are necessarily the result of the firing schedule employed. They may, however, be due in part to the decomposition of excessive amounts of hydrate in the dry brick. With the usual kiln firing, magnesite brick shrink about ⅛ in. per 9 in. of length, the shrinkage being due principally to a decrease in porosity, but also to an increase in the specific gravity of the raw material. The method of stacking and firing magnesite brick and the maximum temperature used vary greatly, the temperature being often as low as 2550 deg. F. but sometimes as high as 3000 deg. The important thing from the steel plant point of view is that the firing shall be sufficient to reduce the after-shrinkage on the brick to reasonable proportions (say less than 1 per cent after 2 hr. at 2750 deg. F.).

Properties

The properties of magnesite brick as used for open hearth furnace bottoms, have already been discussed.

TABLE III

Influence of Molding Pressure on Size and Porosity of Austrian Magnesite Test Pieces

Applied Pressure, Lb. per Sq. In.	Decrease in Test Piece Length (Inches x 10³)			
	T.P.(28)	T.P.(32)	T.P.(29)	T.P.(30)
4,100	0	0	0	0
8,300	.....	98	86	87
12,400	.....	150	138	139
16,600	.....	.....	177	177
20,700	.....	.....	205	204
24,800	.....	.....	.....	226
29,000	.....	.....	.....	244
33,100	.....	.....	.....	261
37,200	.....	.....	.....	273
Final length (unfired)	1.783 in.	1.653 in.	1.604 in.	1.522 in.
Porosity unfired	33.8	28.6	25.8	22.3
Porosity after 2 hr. at 2640 deg. F.	26.1	21.8	18.8	15.4
Per cent burning shrinkage (vertical)	6.3	4.0	3.9	3.8
Per cent burning shrinkage (horizontal)	2.2	2.3	2.2	2.5

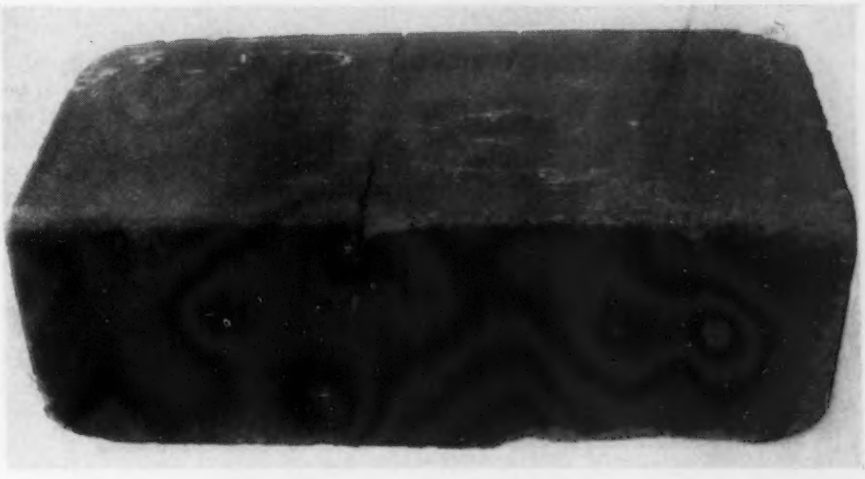
(THE IRON AGE, Aug. 7, 14, and 21, 1941). In addition to such hearth brick, magnesite brick are also used for various special purposes, for example, open hearth furnace ports. The properties of a number of these special brick are set out in Table IV. Brick M1 is made of electrically sintered Grecian magnesite, and shows in addition to good volume stability and relatively high refractoriness under load, a remarkably good thermal shock resistance. M2 is a brick made by adding alumina to 4 per cent iron, Austrian magnesite, and also possesses a thermal shock resistance of 30 reversals. It has been used in open hearth furnace front walls and even in roofs, but possesses the disadvantage as compared with chrome-magnesite brick, of a high thermal conductivity. Its particular field is the rotary kiln as used for dead-burning dolomite or magnesite and for clinkering cement. M3 is a brick made from electrically fused magnesia. This also has a high thermal shock resistance but has not as yet been subjected to any extensive works trials. Brick of this type have however given good service, for instance, in the roofs of arc furnaces making ferro-chrome. Brick M5 represents another type, the unfired magnesite brick. It has a remarkably low porosity and a particularly low permeability which is due in part to the chemical bonds employed. In spite of the fact that it is unfired, it is relatively volume stable, and has a good refractoriness under load. Such brick are often employed in gas and air ends, and also in back and front walls of open hearth furnaces.

The thermal conductivity of magnesite is very high, about 25 BTU at 1830 deg. F. mean temperature, but unlike that of most refractories, it falls off with increasing temperature.

The electrical conductivity of magnesite brick is low at room temperature, but is quite considerable at say 2730 deg. F. This fact is of importance as in certain furnaces, for example, the Greaves-Etchell type arc furnace, where the bottom is required to be conductive. In induction furances any excessive conductivity would give rise to a "strike to the coil," but care should be taken to differentiate between the conductivity of the magnesite itself and that of the moisture present in the lining during the initial melts. Thus in an improperly dried out lining, the earth leakage may be sufficient to require the desensitization of the automatic cut-outs but after the lining has been in use for a short time the conductivity is comparatively low except where it is raised by the intrusion of metal.

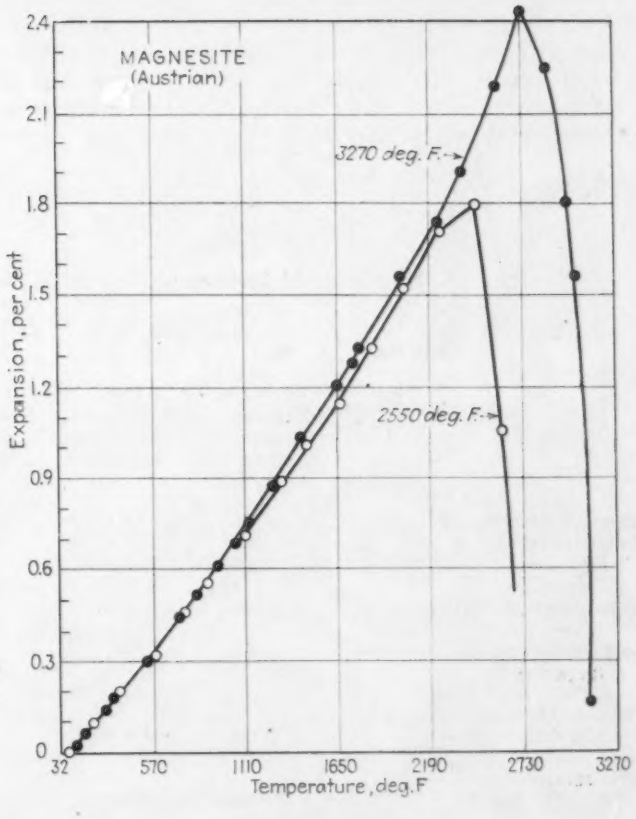
The thermal expansion of magnesite brick is high, namely about 1.2 to 1.4 per cent for the temperature range 70 to 1830 deg. F. Furthermore, the expansion, unlike that of silica, continues well above this temperature. The curves given by Heindl (Fig. 11) on test pieces heated to 3270 deg. F. in an induction furnace show a sudden decrease in expansion rates (and even a shrinkage) at the higher temperature. This phenomena is not, however, strictly thermal expansion but rather after shrinkage, that is, a continuation of the firing shrinkage of the original brick.

The slag resistance of magnesia, particularly to slags rich in iron oxide and lime, is remarkably high and failure is rarely due directly to this cause. More often wearing of the lining is due to alteration of the working face and separation of the latter from the unaltered part of the brick during heating and cooling. The microphotographs shown in Fig. 12 illustrate the manner in which magnesia is attacked by slag. Observations of a large number of such sections show that, particularly with Austrian magnesite, the grains often break down



ABOVE

FIG. 10 — Magnesite block cracked due to hydration in the dryer.



RIGHT

FIG. 11 — Thermal expansion of Austrian magnesite, showing effect of prefiring to 2550 and 3270 deg. F.

into a series of rounded crystals which float out undissolved into the slag. At times complete grains float away.

Such breakdown affords a further illustration of the fact that the bond exerts a controlling influence on the properties of a magnesite brick.

The refractoriness under load of most magnesite brick is very poor in relation to the high melting point of pure magnesia. The ordinary magnesite brick shows little, if any, signs of real inter-crystallization and consequently when the bond softens the brick can be distorted by abrasion, tension or shear. Typical refractoriness under load curves for magnesite and other refractories are given in Fig. 13, from which it will be seen that magnesite brick, unlike fireclay brick, tend to remain rigid to within a small temperature interval of the collapse point.

Any magnesite brick heated above the temperature at which it was fired will shrink. The shrinkage is normally determined by measuring a test piece before and after a given heat treatment, say 2 hr. at 2730 deg. F., but continuous determinations such as those given in Fig. 14 show that some brick start by shrinking rapidly and then slow up while others are still shrinking almost as fast after 2 hr. as they were at the start. Presumably such shrinkage would proceed until the porosity fell to zero but for practical purposes it may be assumed that a brick showing negligible shrinkage on refiring to 2910 deg. F. will not give trouble due to open joints when used in the sub-hearth of an open hearth or arc furnace.

Specifications and Applications

The only specification for magnesite brick at present in use appears to be that employed for open hearth furnaces in Russia (OST. 5888). This states that the brick must have strong edges and corners and must give a clear ring when struck with a hammer. They should not contain more than 3 per cent lime or 3½ per cent silica, and should have a specific gravity of over 3.5. The collapse point under a load of 11 oz. per sq. in. should not be less than 2730 deg. F., while the cold crushing strength should be over 100 lb. per sq. in. and the bulk density not less than 2.6 g. p. ml. This specification is, of course, framed in relation to the raw materials available in Russia, and would, for example, be difficult to meet as regards lime content with other magnesites that nevertheless behave well in service.

The principal uses for magnesite brick are in the basic open hearth furnace, the arc furnace and hot metal mixers. Here they are the standard material for the sub-hearth and to a lesser extent for side wall construction. In addition magnesite brick are used to a considerable extent in the copper and cement industries. One form of brick that has not previously been mentioned in this section is the metal case magnesite brick made by ramming dead burned magnesite into steel tubes which has found a wide application both in open hearth and arc furnaces. It offers a particularly strong form of construction and overcomes a good deal of the spalling normally observed with magnesite brick. It depends for its success on the great tolerance which magnesia shows for iron oxide. A similar idea is the addition of finely ground iron powder to the magnesia cement used for setting brick. In general such cement is merely grain magnesite ground to sufficient fineness, though additions such as silicate of soda, are also made.

TABLE IV

Properties of Special Magnesite Bricks

Code No.:	M. 1.	M. 2.	M. 3.	M. 5.
Type:	Electrically Sintered Grecian Magnesite	Austrian Magnesite with Alumina Addition	Electrically Fused Magnesia	Unfired Chemically Bonded Magnesite
Apparent porosity, per cent	22.2	18.5	21.4	13.2
Bulk density, g.p.cc.	2.76	2.90	2.80	2.94
lb. per cu. ft.	173	181	175	184
Apparent specific gravity	3.54	3.56	3.56	3.39
Cold crushing strength—on end —lb. per sq. in.	1470	1860	.....	5120
Permeability to air—perp. 9 in. x 3 in. face—1 skin	0.088	0.039	0.073	0.0044
After contraction, 2 hr. 2730 deg. F.	0.3 Per Cent	0.3 Per Cent	0.0 Per Cent	0.3 Per Cent (Exp)
Refractoriness under load, maintained temp. test, 25 lb. per sq. in. at 2910 deg. F.	.....	.....	Failed after 20 min.	Failed after 12 min.
Rising temp. test.				
Initial softening	2695 deg. F.	2570 deg. F.		
Rapid softening	2910	2860	.....	.....
Failure (50 lb. per sq. in.)	1630	2950		
Thermal shock resistance. No. of reversals	30+	30+	30+	2

Acknowledgment

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Bibliography

(Excluding references already dealt with under furnace sections)

GENERAL

Banco, R., *Der magnesit und Seine* Verarbeitung. Steinkopff, Dresden and Leipzig, 1932.

Comber, A. W., *Magnesite—as a Refractory.* Charles Griffin & Co., Ltd., London, 1937.

Knibbs, N. V. S., *Lime and Magnesia.* Ernest Benn, Ltd., London, 1924.

Lumsden, J., *Magnesium, Magnesite and Dolomite.* Imperial Institute, London, 1938.

Mellor, J. W., *Comprehensive Treatise on Theoretical and Inorganic Chem.*, vol. IV, p. 283.

Spotts, McDowell J., and Howe, R. M., *J. Amer. Ceram. Soc.*, 1920, 3,185.

Norton, F. H., *Refractories.* McGraw-Hill Book Co., Inc., New York, 1931.

Redlich, K. A., *Z. Prakt Geol.*, 1909, 17, 300.

Salmang, H., *Die Keramik.* Springer, Berlin, 1933.

Tyler, P. M., *Info. Circular No.* 6437. U. S. Bureau of Mines, 1931.

Tyler, P. M., and Davis, A. E., U. S. Bureau of Mines, *Minerals Yearbook*, 1937.

Wilson, M. E., Dept. of Mines Canada, *Memo. No. 98, 1931. Trans. Amer. Ceram. Soc.*, 1917, 19, 254.

THE COMPOUND MgO

Lattice Structure and other Properties.

Bragg, W. L., *Phil. Mag.*, 1920 (6), 40, 174, 18.

Davey, W. P., and Hoffmann, E. O., *Phys. Rev.*, 1920 (2), 15, 333.

Gerlach, W., and Paul, O., *Zeit. Physik.*, 1921, 7, 116.

Hedvall, J. A., *Zeit. Anorg. Chem.*, 1922, 120, 327.

Hull, A. W., *J. Amer. Chem. Soc.*, 1919, 41, 1169.

Kanolt, C. W., *J. Wash. Acad. Sci.*, 1913, 3, 315; *Tr. Amer. Cer. Soc.*, 1913, 15, 171.

Ruff, O., and Goecke, O., *Zeit. anog. Chem.*, 1911, 24, 1459.

Sacchi, A., *J. Prak. Chem.*, 1843 (1), 28, 486.

Schiebold, E., *Min. Soc. Gottingen*, 1921, 4.

Wollan, E. O., *Phys. Rev.*, 1930, 35, 1019.

Wycoff, R. W. G., *Am. J. Sci.*, 1921, 5, 1, 138.

Binary and Tornary system containing Magnesia

MgO-SiO_2

Allen, Wright and Clement, *Am. J. Sci.*, 1906 (4), 22, 387.

Allan, E. T., and White, W. D., *Am. J. Sci.*, 1909 (4), 27, 1.

Anderson, O., and Bowen, N. L., *Am. J. Sci.*, 4th Sep., 37, 487, 1914.

Bowen, N. L., *Am. J. Sci.*, 4th, Sep., 38, 207, 1914.

Greig, J. W., *Am. J: Sci.*, 1927, Pt.I. 13 (73), 1. Pt. II 13 (74), 133.

MgO-Al_2O_3

Bronn, J., *Feurfest*, 1925, 1 (7), 67.

MgO-Iron Oxide

Fisk, H. G., and McCaughey, W. J., *Ohio State Univ. Expt. Sta. Bull., No. 70*, Vol. 1, No. 4, Pt. I, 1932.

Krause, O., and Ksinik, W., *Feurfest*, 1931, 7, 17, and 1932, 8, 23.

Roberts, H. S., and Merwin, H. E., *Am. J. Sci.*, 1931, 21, 145.

Salmang, H., *Bor. deut. keram. Ges.*, 1932, 13, 371.

Weyl, W., *Tonind Ztng.*, 1929, 53, 559.

MgO-CaO

Rankin, G. A., and Merwin, H. E., *J. Amer. Chem. Soc.*, 1916, 38, 568.

MgO-CaO-SiO_2

Ferguson, J. B., and Merwin, H. E., *Am. J. Sci.*, 1919, 48, 6.

MgO-Al_2O_3-SiO_2

Watts, A. S., *Trans. Amer. Ceram. Soc.*, 1917, 19, 453.

Rankin, G. A., and Merwin, H. E., *Am. J. Sci.*, 1918, 4th Sep., 45, 301.

MgO-ZrO_2, MgO-Cr_2O_3, etc., binery melting points

Wartenberg, H. von, and Prophet, E., *Zeit. anorg. allgem. Chem.*, 1932, 208, 369.

MgO-Zircon

Chesters, J. H., and Rees, W. J., *Trans. Ceram. Soc.*, 1930, 29, 309 and 1931, 30, 217.

MgO-TiO_2-ZrO_2—ternary melting points

Ruff, O., Ebert F., and Loerpabel, W., *Z. anorg. allgem. Chem.*, 1932, 207, 308.

RAW MATERIALS

Brucite

Anon. *Can. Met. Jnl.*, 1941, 62, 466. *Brick Clay Record*, 1941, 99 (2) 44. *Chem. Tr. Jnl.*, Oct. 17, 1941. *Rock Products*, May, 1941. *Ref. J.*, 1941, 17, 327. *Blast Fce. Stl. Plnt.*, 1942, 30, 384.

Magnesite

Anon. *Rock Products*, 1941, 44 (7), 87. *Can. Metals Met. Inds.*, 1940, 3, 251. *Can. Machinery*, 1939, 50 (11), 35, 55.

Birch, R. E., *Industrial Rocks and Minerals*, A.I.M.E., 1937, N. York, p. 432.

Clemmer, J. B., Doerner, H. A., and DeVaney, F. D., *Mining Technology*, Jan., 1940, vol. 4, p. 1 of Tech. Pub. No. 1148.

Donald, W., *Trans. Cer. Soc.*, 1917, 17, 486.

Lanigan, A. J., *Blst. Fce. Stl. Plnt.*, 1930, 18 (4), 678.

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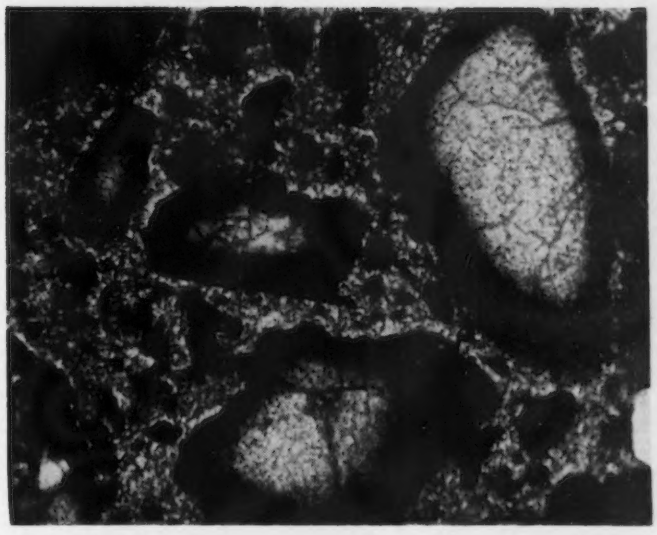

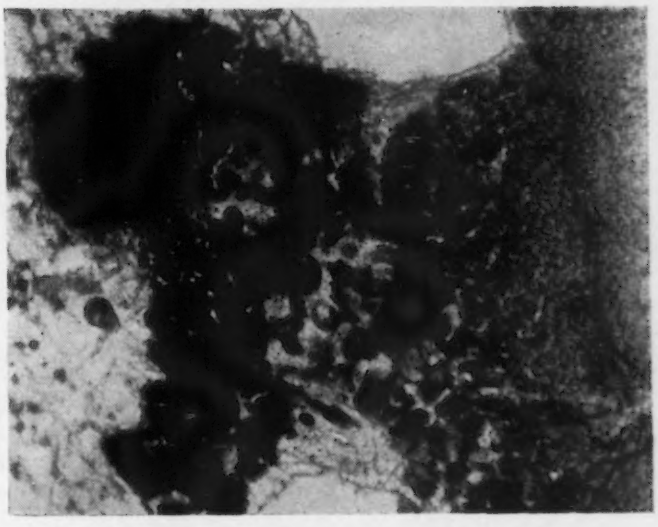

FIG. 12 — Grecian magnesite induction furnace lining. Top picture shows absorption of iron oxide by magnesia grains behind the working face. Middle picture shows lining breaking up as a result of slag attack. In the bottom picture the lining is shown broken up into small units as a result of slag attack (ordinary light x 105).

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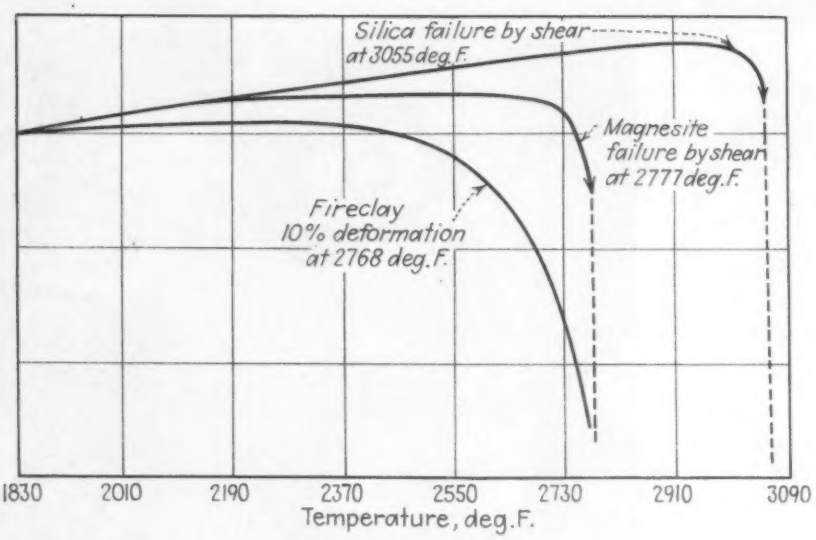


FIG. 13—Rising temperature refractoriness under load curves for magnesite, fireclay and silica brick. (50 lb. per sq. in., 18 deg. F. per min. rate of rise.)

Lathe, F. E., *Can. Chem. Met.*, 1926, 10 (1), 3.

Lebeter, F., *Mine and Quarry*, Eng., 1939, 1, 153.

Redlich, K. A., *Zeit. prakt. Geol.*, 1927, 35, 117; *Feurfest.*, 1932, 8 (66), 98, *Angew. Chem.*, 1932, 45 (39), 621; *Zeit. Prakt. Geol.*, 1934, 11, 166.

Sea Water Magnesia

Anon. THE IRON AGE, 1938, May 5, p. 35; *Blst. Fce. Stl. Plant*, 1939, 27, 388; *Mining and Met.*, 1940, vol. 21, May, p. 246; THE IRON AGE, 1940, 145, No. 18, 51; *News Editn. Am. Chem. Soc.*, 1941, Sep. 10.

Chesny, H. H., *Brit. Pat.* 482339, Sept. 24, 1936; *Brit. Pat* 482340, Sept. 24, 1936; *Brit. Pat.* 483340, Sept. 24, 1936; *French Pat.* 827065, Sept. 23, 1937; *Brit. Pat.* 540139, April 18, 1939.

Production of Dead Burned Magnesite

Dissociation of the Carbonate

Bole, G. A., *J. Amer. Cer. Soc.*, 1919, 2, 410.

Brill, O., *Z. f. anorg. Chem.*, 1905, 45, 275.

Conley, J. E., *Am. Inst. Min. Met. Eng.* Tech. Pub. No. 1037, 1939.

Huttig, G. F., Nestler, W., and Hnevkovsky, O., *Ber. deut. Chem. Ges.*, 1934, 67, 1378.

Commercial Dead-Burning

Alterra, A. G., *Brit. Pat.* 394311, July 5, 1933.

Ferguson, J. B., *J. Amer. Ceram. Soc.*, 1918, 1, 439.

Konopicky, K., and Kassel, H., *Ber. deut. keram. Ges.*, 1936, 17, 465; *ibid.*, 1937, 18, 97; *ibid.*, 1937, 18, 419; *Brit. Pat.* 432303, Aug. 8, 1935.

Krause, O., and Ksinsik, W., *Feurfest.* Jarhg. VIII, pts. 1 and 2, and Krause, O., and Guhr, H., VII, pt. 9, 129.

Mellor, J. W., *Trans. Ceram. Soc.*, 1917, 16, 85.

Schurecht, H. G., and Frechette, V. D., *J. Amer. Ceram. Soc.*, 1940, 23, 134.

Electrically Fused Magnesia

Bronn, J., *Metall u. Erz.*, 1926, 23, 91; *J. Chem. Z.*, 1925, 49, 1064; *Chem. Ztng.*, 1925, 49, 1053.

Hutton, R. S., *Trans. Ceram. Soc.*, 1905, 5, 116.

Moore, B., and Patrick, W. L., *Ind. Chemist*, 1935, 11 (127), 318.

Moore, B., *Trans. Ceram. Soc.*, 1940, 39, 41.

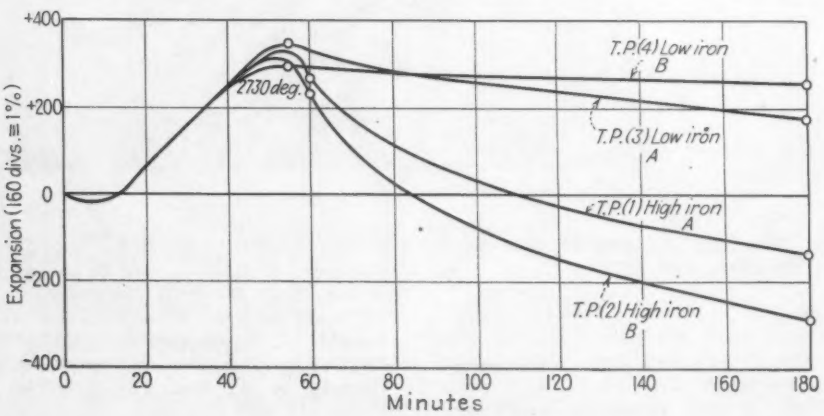
Properties of Dead Burned Magnesite Grain

Cornu, F., *Centr. Min.*, 1908, 305.

Dworzak, E., *Feurfest.*, 1930, 6, 145.

Scott, A., *Trans. Cer. Soc.*, 1917, 17, 475.

FIG. 14—Continuous after-contraction curves for low iron and high iron magnesite brick.



MANUFACTURE OF MAGNESITE BRICK

General

Craig, J. W., *J. Can. Ceram. Soc.*, 1938, 7, 25.

Endell, K., *Met. u. Erz.*, 1921, 18, 597.

Englehorn and Co., *Austrian Pat.* 103,718, Aug. 29, 1924; *Patent J.*, 1924, 1, 840, No. 211,873, Feb. 20, 1924.

Hon. Adv. Council, *Sci. and Ind. Research*, Ottawa; *Brit. Pat.* 546,400, July 9, 1941.

Litinsky, L., *Ber. deut. keram. Ges.*, 1935, 16, 565; *Brick*, 1936, 89, 212.

Meyerhofer & Co., *French Patent* 775,-024, Dec. 18, 1934.

Salmang, H., and Schnitzler, K., *Ber. deut. keram. Ges.*, 1933, 14, 61.

Trostel, L. J., THE IRON AGE, Dec. 5, 1935, 26 and 95; *Blast Fce. Stl. Plnt.*, Sept., 1935, 621.

Grading

Salmang, H., and Nomitz, P., *Sprechsaal*, 1934, 67 (47), 717; *ibid.* (48), 729; *ibid.* (49), 745; *ibid.* (50), 759; *ibid.* (51), 775.

Dworzak, E., *Feurfest*, 1930, 6, 145.

Souring

Budnikoff, P. P., *Z. anorg. allgem. Chem.*, 1930, 191, 79.

Chesters, J. H., and Weyl, W., *Trans. Cer. Soc.*, 1932, 31, 295.

Drying

Chesters, J. H., and Weyl, W., *ibid.*, 1933, 32, 201.

Burning

Chesters, J. H., and Parmelee, C. W., *Trans. Ceram. Soc.*, 1933, 32, 349; *ibid.*, 1935, 34, 203.

Chesters, J. H., Clark, G. L., and Lyon, K. C., *ibid.*, 1935, 34, 243.

Goslich, K. A., *Tonind Ztng.*, 1932, 56, No. 39, 511.

PROPERTIES OF MAGNESITE BRICK

General

Anon, U.S.S.R. *Specfctn.*, O.S.T. No. 5888.

Chesters, J. H., and Lee, J., *Trans. Cer. Soc.*, 1937, 36, 294.

Chesters, J. H., and West, J., *Scot. Iron and Steel Inst.*, 1938-39, 46 (4), 65.

Hirsch, H., *Arch. Eisenhüttenwesen*, 1927, vol. 6, 437; *Tonind Ztng.*, 1928, 52 (25), 479; *Stahl u. Eisen*, 1928, 48 (12), 371.

White, H. E., *J. Amer. Ceram. Soc.*, 1938, 21, 216.

Microscopic Examination

Chesters, J. H., *Ref. J.*, 1935, 11, 180.

Heuer, R. P., *Rock Products*, 1934, 37 (12), 42.

Thermal Expansion

Austin, J. B., *J. Amer. Cer. Soc.*, 1931, 11, 795.

Endell, K., and Steger, W., *Stahl u. Eisen*, 1928, 48, 722.

Heindl, R. A., *Bur. Stand. J. Res.*, 1933, 10, 715.

Houldsworth, H. S., and Cobb, J. W., *J. Amer. Ceram. Soc.*, 1923, p, 649.

Spalling

Endell, K., *Zement.*, 1932, 21 (37), 522; *Stahl u. Eisen*, 1932, 52, 759, 856; *Arch. Wärmewirtschaft*, 1932, 12, 320.

Endell, K., and Müllenseifen, W., *Ber. deut. keram. Ges.*, 1933, 14, 16.

Refractoriness under Load

Endell, K., *Ber. deut. keram. Ges.*, 1921, 2, 73.

Hirsch, H., and Pulfrich, M., *Brit. Clayworker*, 1924, 33, 112.

Longchombon and Ku-Fuh-Tsiang, *Sprechsaal*, 1932, No. 4, 67; *Rev. d. metall.*, 1931, 28, 6, 324; *Rev. Mat. Constr. trav. publiques*, 1931, No. 265, p. 186 B.

Wilson, H., *J. Amer. Ceram. Soc.*, 1934, 7, 34.

Wilson, H., Sims, C. E., and Schroeder, F. W., *J. Amer. Ceram. Soc.*, 1924, 7, 907.

Slag Resistance

Howe, R. M., Phelps, S. M., and Ferguson, R. F., *J. Amer. Ceram. Soc.*, 1923, 6, 589.

Miksch, R., *Feurfest*, 1932, 6 (8), 98; *Glashütte*, 1932, 62 (26), 443.

Salmang, H., *Stahl u. Eisen*, 1927(i), 47, 1816; *Arch. Eisenhüttonw*, 1933, 6, 341.

Salmang, H., and Miksch, R., *Stahl u. Eisen*, 1929 (ii) 1724.

Salmang, H., and Schick, F., *Arch. Eisenhüttenw.*, 1928, 29, 439.

Thermal Conductivity

Green, A. T., *Trans. Ceram. Soc.*, 1921, 21, 394; *ibid.*, 1922, 22, 393; *Pottery Gaz.*, 1938, 53 (616), 1607.

Norton, F. H., *J. Amer. Ceram. Soc.*, 1927, 10, 30.

Wilkes, G. B., *ibid.*, 1933, 16, 125.

Electrical Conductivity

Diepschlag, E., and Wulfesteig, E., *Tonind. Ztng.*, 1930, 54 (1), 17.

White, H. E., *J. Amer. Ceram. Soc.*, 1932, 11, 598.

APPLICATIONS

Cross, A. H., and Rees, W. J., *Trans. Cer. Soc.*, 1934, 33, 379; *ibid.*, 1934, 33, 431.

Fitzgerald, A. E., *Met. and Alloys*, 1932, 3, 25; *Min. and Met.*, 1931, 12 (300), 527; *Blst. Fce. Stl. Plnt.*, 1932, 20 (8), 658.

McCallum, N. E., *ibid.*, 1920, 8, 52.

McCaughey, W. J., and Lee, H. C., *Min. and Met.*, 1937, 18, No. 365, 253.

Roller Schuette, C. N., *Bur. Mines Rep. of Inv. Ser., No.* 2896, Oct., 1928.

Stützel, H., *Stahl u. Eisen.*, 1940, 60, 1061.

Tritton, F. S., *Proc. Roy. Soc.*, 1925, 107A, 287.

Low-Temperature Spraying of Metals

A NEW, low cost, rapid means of applying a protective metal coating to metal assemblies or structures, re-coating areas burned by welding, patching or repairing small areas in large galvanized assemblies where the coating has been damaged, in addition to providing a good base for painting, is announced by Alloy-Sprayer Co., 2040 Book Building, Detroit. The operation consists of spraying the surface to be protected with a coating of Galv-Weld metal by means of an Alloy-Sprayer gun, a portable, self-contained unit with a thermostatically controlled metal melting pot and a means of atomizing and spraying the melted metal. It is operated by air pressure. The equipment is light and compact and even when filled with metal, it can be readily manipulated by hand.

A typical use of the gun and metal is for re-galvanizing the areas from which galvanizing has been burned during arc or resistance welding operations. The oxide remaining from the welding operation is first thoroughly brushed off and the area adjacent to the weld is similarly cleaned. Then while the metal is still hot, the entire burned surface can be sprayed. The thickness of the coating will be from 0.001 to 0.008 in., depending upon the degree of resistance to corrosion required.

Where production sequence does not permit the coating immediately following the welding operation, the work is first cleaned and then reheated to from 250 to 475 deg. F. and then sprayed. Cleaning should be done either with a flexible shaft grinder or power driven wire brush. Re-heating for spraying is accomplished by infra-red lamps, an oven or by an open flame, preferably one with a reducing atmosphere.

Galv-Weld, an alloy high in lead, melts and is sprayed at about 500 deg. F. Speed of spraying will range from upwards of 50 lineal ft. per min. for a corner coating or bead coating.

A sample of metal coated to a thickness of 0.001 in. went 42 hr. in a salt spray bath before any indication of rust spots began to appear, according to the testing laboratory. This thickness is about the minimum that can be applied evenly and uniformly. Additional thickness up to about 0.004 in. is the customary for average requirements.

Since only low temperatures are required for excellent bonding (see microphotograph), there is no warping and temper drawing does not occur. Considerable zinc is saved by the process which permits the re-galvanizing of only those areas that were damaged rather than the whole surface.

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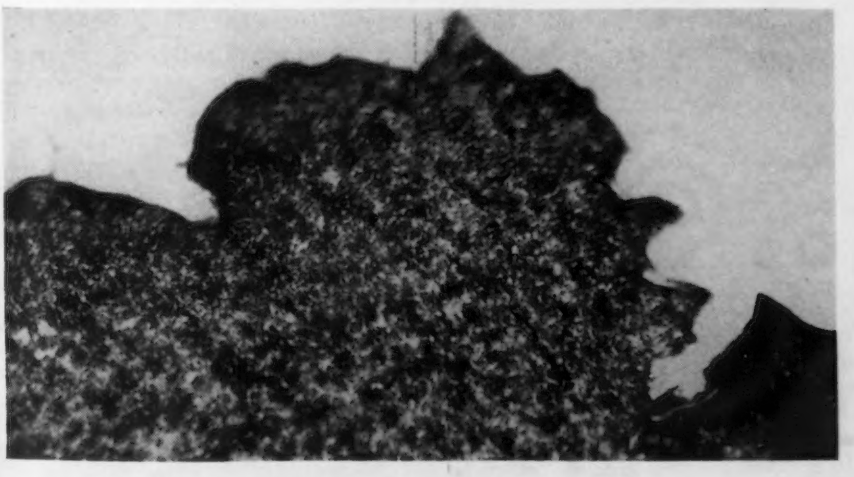
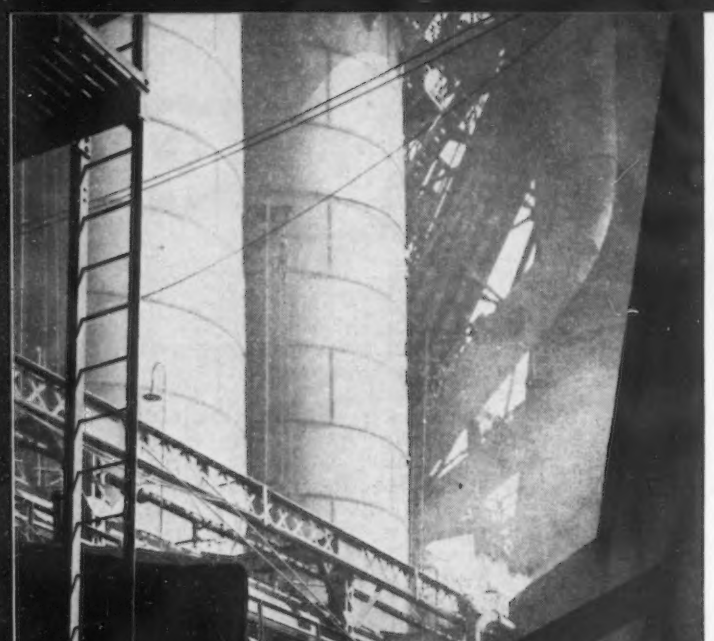
PHOTOMICROGRAPH (500 times) of bond between Galv-Weld and steel (light area) as applied by the Alloy-Sprayer shows the mechanical bond possible by means of low-temperature sprayed metal. A definite tinning of the sprayed metal with the base metal is indicated.



SPRAYING a protective coating of Galv-Weld metal by means of an Alloy-Sprayer on the welded (burned) joint of a galvanized assembly can be done rapidly and inexpensively and requires no specially trained help. Portability of the equipment permits it to be used successfully for coating work of any size.



Steel and the P

o o o

By FRANCIS JURASCHEK
Manager of Commercial Research, Carnegie-Illinois Steel Corp.

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A PEACETIME demand of 50 million tons of steel a year will keep 75 per cent of the nation's steel capacity producing. Here is a major opportunity, says the author, of continuing only the most efficient units and of improving the rest up to the limits of a balanced production.

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THE bottleneck in all postwar plans will come the day after peace is declared. Within a relatively brief period millions of men will be demobilized from our armed forces, and even more quickly, additional millions from industrial plants now making the munitions of war. Few of these men will be in any mood to tolerate unemployment. Thinking men everywhere realize that hesitation about getting the demobilized men back to work in civilian pursuits will be disastrous.

Recognition of that fact is the real reason why today in discussions of postwar planning, one hears the phrase "full employment" at every turn. Back of it lies a single, fundamental concept of modern economics: The money which pays wages for work done, creates demand for the products of that work. This is a truism, of course, only in the broad economic sense. It is seldom true in any specific case. Wages paid for making automobiles do not directly create demand for automobiles, except in isolated cases. The production of the automotive industry cannot be absorbed by the workers in the automotive plants, and it is even more apparent that the output of the steel industry cannot be absorbed by the workers in the steel industry. But society, with its diversified requirements for goods and services, becomes a whole which is greater than the sum of its individual parts; because one must reckon not only on the individual requirements of all the John Does and Mary Roes who make up the individual units of that society, but also on the collective requirements evidenced in such public and private joint enterprises as highways, transportation systems, schools, public utilities, communications, and so forth.

For a discussion of steel's technological post-war position, see "Is Steel a Laggard?" THE IRON AGE, *March* 4, 1943.

When society is considered as a whole, therefore, the economic problem of postwar planning in its broad aspects boils down to this keynote statement: Provide enough work so that wages paid will create enough demand for the products of that work to provide enough work so that wages paid will create enough demand, etc., etc. In brief, the elements of modern economics assume the form of a vast circle around the perimeter of which each of three factors chase each other unceasingly; wages, demand, work, wages, demand, work.

A dollar tucked away in a mattress is only a dollar, and the value it represents is nil while it remains tucked away in the mattress. But the same dollar paid out to the butcher, who pays it to the baker, who pays it to the miller, who pays it to the farmer, who uses it to buy clothing, whence it passes through a thousand other hands for a thousand other useful purposes, is creating values with every transaction and producing income to stimulate demand. If we can keep that dollar and all its companions in constant circulation, there will be little fear of paying debts or rebuilding war-torn countries. It is when money stops circulating that calamity occurs. And the greatest incentive to keep money circulating lies in providing employment in fullest possible measure so that wages will be paid regularly.

If people can only be kept working, money *will* circulate, for work creates new values *and* new demands simultaneously. The general problem of postwar planning always comes to this end point, no matter where it begins: "How can full employment be provided?"

The problem must be tackled simultaneously from two complementary viewpoints: that of the individual business or industrial organization in an effort to determine the extent of its own employment capabilities, and the viewpoint of cooperative industry effort in the determination of how

Post-War World . . .

. . . Around the circle of modern economy, wages, demand and work unceasingly chase. If people can only be kept working, says the author, new values and demands will be simultaneously created. How the steel industry can employ its share of workers and estimate its share of market, and where this fits into the industrial whole is here analyzed.

that industry can set up its own enterprises to absorb, interdependently with other correlated industries, its proper share of the full employment load. The first viewpoint was discussed in a suggested "Outline for Postwar Planning" in the April issue of *Industrial Marketing* by the present author. The second is treated as a suggested industry angle of approach here.

From this viewpoint the problem immediately suggests a threefold analysis: What is full employment? What production of goods or services will full employment yield? What demand will the wages of full employment create?

The answers to these three questions can be obtained only through the sincere cooperation of all business and industry groups working together. A rough outline of an analytical approach, together with an argument which a single industry might be induced to accept, are tentatively broached below as the personal opinion of one research worker. The opinions expressed are in no way official. Each step is subject to careful deliberation by all interested parties, and the method of attack is offered subject to adjustment in the detail of its figures and conclusions.

The starting point might well be such an estimate of what constitutes full employment as David Prince, of General Electric Co., has offered in his "V + 2" program. On the assumption that two years after victory 57 million jobs must be provided for a total of 60 million employables, the distribution may be something like this:

	Millions
Agriculture	10.5
Construction	5.5
Manufacturing	14.5
Transportation, utilities	5.0
Forestry, fishing, mining, quarrying	1.5
Trade, distribution, finance	9.0
Professional, service, government	10.5
Army, Navy	1.5
Miscellaneous	1.0
Total	57.0

to which is added 3.0 million floaters or people in process of changing jobs, to arrive at the total of 60 million employables.

Accepting this estimate for the time being in order to proceed with the argument, it should be noted that Mr. Prince puts the jobs in manufacturing at 14.5 million, or more than 40 per cent larger than any previous normal figure. Now the steel industry is included in this category. At roughly 100 per cent of capacity operations, the steel industry employs, in round figures, some 650,000 people and produces about 66 million tons of steel products, in this country. It is obvious, however, that capacity has been expanded for war and that 100 per cent operation produces more steel than a peace-time economy can ab-

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"TWO million tons of steel a year for the farm market." Implements like this hay chopper on the Westinghouse proving farm will be needed at home and for export, will accompany the spread of rural electrification.

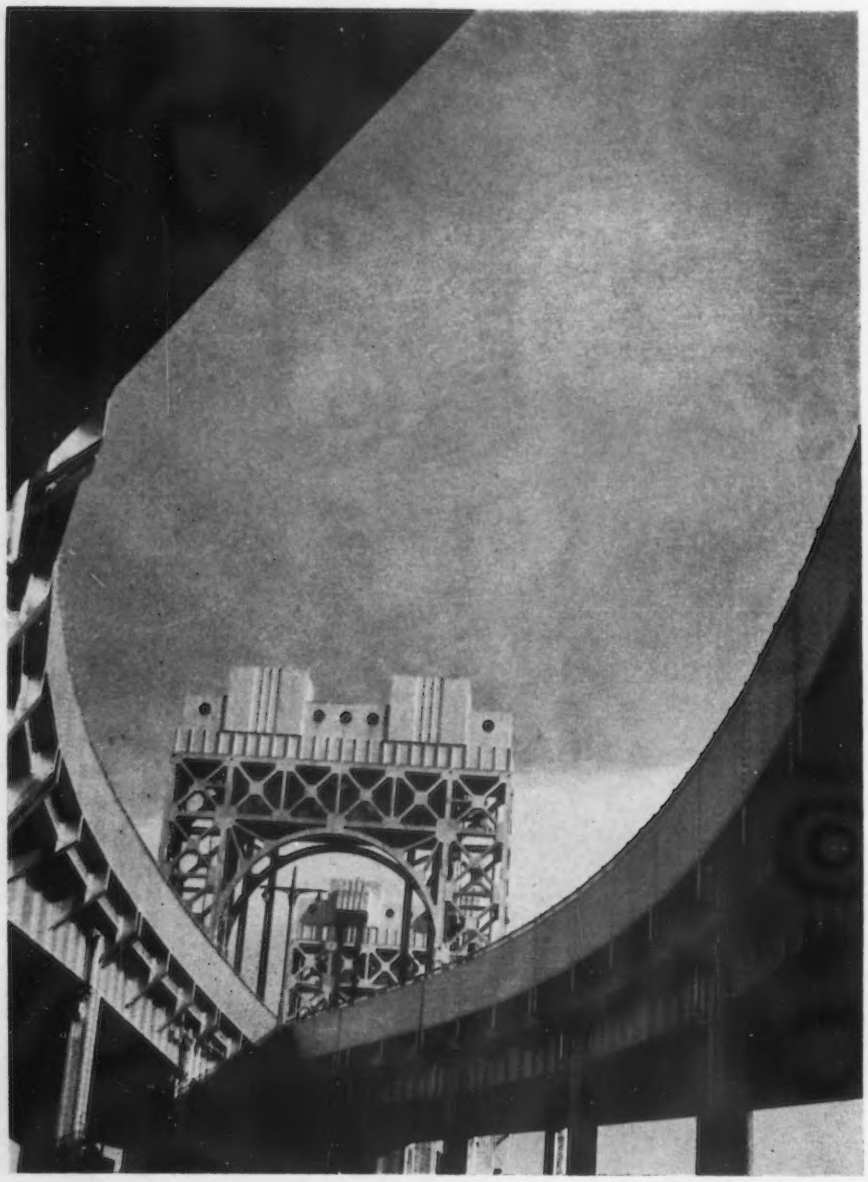
o o o

sorb. It is quite probable, however, that the national income corresponding to the gainful employment of 57 million people in the United States could warrant the production of about 50 million tons of steel products annually. This production would be around 75 per cent of capacity and would require the employment of about 550,000 people. Thus, by a series of assumptions which must be carefully checked by the steel industry itself in cooperation with all the steel consuming industries upon which it depends, it may be determined that of Mr. Prince's estimate of 14.5 million jobs in manufacturing, the steel industry proper might be expected to provide 550,000.

The next question to be faced is, how that production can be absorbed. On the basis of various preliminary studies of the consumption of steel probably to be expected under full employment conditions, the picture of such a distribution of steel products may be tentatively set down something like this:

	Millions of Tons
Agriculture	2
Automotive, aviation	8½
Construction	6½
Containers	3½
Household, institutional	3
Machinery and tools	1½
Mines and quarries	½
Oil and gas	2½
Railroads	4½
Shipbuilding	1
Jobbers	8½
Export	8
Total	50

Can such a distribution be attained? This question is of paramount interest to the steel industry, because that industry cannot provide its full share of employment within its own ranks unless the industries which use steel can provide the full employment necessary to produce the volume of goods which will absorb such a total amount of steel as will provide full employment within the steel industry itself. Hence the following arguments may serve as a starting point for debate within the steel industry *and* those interdependent industries which use steel, to justify the production of 50 million tons of steel products a year.



THE John Does and Mary Roes have their collective, as well as their individual needs. The biggest single market for steel is construction—transcontinental highways, housing units and vast power projects.

The farm market will expand if for no other reason than that a considerable quantity of American farm products will be in demand to feed the world for a long time after the war. Agricultural implements will be needed at home, and the U. S. will also export large quantities of them. The American farmer will spend money to improve his buildings, fences and land. He will enjoy the benefits of rural electrification projects—and buy household appliances like his brother in the city. Two million tons of steel a year is a conservative figure for the farm market.

The automotive and aviation industries both should enjoy very good markets after the war. The new higher octane rating gasolines now being produced for aviation will accelerate the obsolescence of present automobiles, and for a few years at least the demand for automobiles should be in the neighborhood of 6 million units a year instead of the normal 4 million units. Only a small proportion of the war planes are adaptable for peacetime commercial flying. Most were built for extremely high speeds and combat performance at the expense of load-carrying capacity, comfort and fuel efficiency, or for heavy bomb load capacity plus heavy armament plus speed. In peace, different characteristics, and especially fuel economy, will be required, for it will not be good business commercially to transport huge quantities of fuel to refueling stations everywhere simply in order to fly faster from here to there. There are many economic points to be considered, and it seems likely that entirely new types of transport and cargo planes will be built after the war, and built in large quantities.

Construction will probably go in the direction of transcontinental highways, with bridges and elevated roadways and ramps where the highways

(CONTINUED ON PAGE 122)

ILLINOIS TOOL *Milling*

where DESIGN and PRECISION combine to create better tools!

In making an efficient cutting tool, whether it be a hob, broach or cutter, the milling operation is of extreme importance. Precise and skillful craftsmanship is required to produce the tool exactly as designed. This is particularly true when special construction features are incorporated.

The illustration above shows an Illinite Slab Milling Cutter being milled with extra large fillets designed to follow the natural chip curvature for maximum removal of material. This is typical of the special construction provided in Illinite cutters to achieve utmost efficiency in accordance with the specific purpose of the tool.

Discuss your tool design problems with an Illinois Tool engineer—his suggestion will point the way to increased production through greater tool efficiency.

OVERNIGHT TO ALL AMERICA . . . FROM THE HUB OF AIR TRANSPORTATION

ILLINOIS TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS
2501 N. Keeler Avenue, Chicago, Illinois
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

ILLINITE

HOBS • BROACHES • SHAPER CUTTERS • GEAR CUTTERS
MILLING CUTTERS • GROUND FORM TOOLS • SPECIAL TOOLS

Assembly Line . . .

STANLEY H. BRAMS

• Strikes and strike threats again plague automotive plants . . . upgrading techniques studied by Automotive Council committee . . . Bonds reduce absences at Norge plant.

DETROIT — The labor pot is noisily boiling. The Detroit record of the past few weeks, a shameful one in time of war, includes a walkout at Packard, the 28,000-man "spontaneous" strike at Chrysler, further short-lived tie-ups at Ford, and additional minor disturbances.

First, there appears to be under way a concerted underground campaign by labor to discredit the National War Labor Board. Beyond that, is a growing tide, fomented by labor leaders, to obtain pay rate increases matching costs of living which are rising in the face of the well-intentioned but rather feeble efforts of OPA. More sinister than any of these two factors is the growing race problem in Michigan plants which many factory executives believe is quite definitely the work of Axis agents.

Consider, further, the bewilderment of labor when it is implored one day to work harder and cut out absenteeism, and is laid off the next day for valid reasons — material shortages, changes in war strategy, and the like.

Add to that the growing feud within the UAW between pro-communist and anti-communist groups or, from another standpoint, between anti-Reutherites and pro-Reutherites, and you have the makings of a fine dog fight which is bound to break out this summer here, there and perhaps everywhere.

The discrediting of the NWLB, begun by John L. Lewis and now carried on by other union leaders who do not want Lewis to get ahead of them, seems to be moving in full blast in the auto workers' ranks. There is no other way walk-outs and slowdowns can be rationalized when they break out all over the industrial landscape at regularly cycled periods. This situation probably was the root of the Chrysler strikes of a few weeks ago, and more along such lines is likely later.

The color problem is becoming a serious one in Michigan. It has been in the public attention for the past couple years in Detroit, keynoted by a battle of quasi-Ku-Kluxers against a colored housing project in the northeast end of the city, and by frequent gang fights between colored and white groups in the city's high schools. This incitement of race problems reached into the factories late in May when the upgrading of Negroes on production work at the Packard Motor Co. brought a strike of white workers in protest. The upgrading was then postponed, pending discussions a few days later, whereupon the Negroes walked off the job.

Climax was reached in this matter when white Packard employees walked out in force last week and tied up practically all of the Rolls-Royce aircraft engine job. They milled about factory gates while union sound trucks urged them to go back to work. Heady with their success, they hooted down their leaders and paid no attention to pleas from management and the Army. The "spontaneous" strike idea of the past winter has now proved a Frankenstein for its union creators, who have now come to the point where they have actually, not hypothetically, lost control over their plant puppets.

This incident is typical of the race tension spreading out from Detroit. At Flint, colored and white workers recently disputed passage on a bridge in the city, began stone throwing, and brought to hand a situation which trembled for half an hour or so on the brink of a full-fledged race riot. Similar incidents, not as large, are reported from Saginaw. A fine and devious Himmler hand would be in no wise a surprise in such circumstances.

TURNING to another labor phase, the dispute between Walter Reuther and his opponents on the UAW Board appears to be reaching toward a climax timed for the annual meeting of the union late in September in St. Louis. Leo LaMotte, the chairman of the Chrysler section of the UAW, has publicly accused Reuther of inciting the so-called wild cat strikes in the Chrysler plants in May. Reuther has denied this and coupled the denial with a demand that LaMotte explain his conduct before the international board meeting —an action which supposedly took place earlier this week at the monthly gathering of the board in Toronto.

This led to the hypothesis in some

CHECK LINE: Inspectors check high-calibre ammunition on a continuous line in an Oldsmobile-General Motors shell plant.

THE SITUATION: a war plant was mass-producing precision parts on a Pratt & Whitney Jig Borer — a perfectly good practice, though the inbred accuracy of this tool makes it most commonly a toolroom machine. They had finished one job that was bored and counterbored from both sides. They inspected all holes at once with a fixture having mounted plugs. It was as tough a job as you could find anywhere, but every piece passed 100% . . . an amazing record. Yet the next job by the same operator on the same machine was a run of 400 pieces with *395 rejections* . . . equally amazing, but in the wrong direction.

Clues: the Pratt & Whitney field service engineer discovered that the two parts were generally similar, but that the first had a scraped surface to rest on and had square, solid shoulders, whereas the second had no scraped surface and was undercut. Further, the operator was green.

Problem: why the slip in accuracy?

You'll need only 5 seconds for this

Solution: that's right! You can't expect accuracy to "tenths" without a scraped surface as a base. Secondly, the undercut led the operator into the common error of springing the piece as he clamped it down. The P&W man recommended establishing an accurate base surface and the use of proper clamping. The job was then rerun quickly without trouble.

Busy as they are, Pratt & Whitney field engineers are always glad to help you solve precision-work problems. Remember this: *the accuracy is in the machine; use it right, and you can get it out.* Many helpful tips are in the instruction books that go along with every P&W machine. Have your *operators* study these books and learn the right way.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
West Hartford, Connecticut

PRATT & WHITNEY

MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

WEST HARTFORD CONNECTICUT

Basic Accuracy for Mass Production

quarters that Reuther may be rallying strength to take over the auto union control at the annual meeting. All is not solid within his own ranks, however—the Buick local has gone on record against him. To compensate he appears to have found some backers in Chrysler locals which refuse to back up the charge made by LaMotte. In general Reuther is identified with the anti-communist elements in the union, his opponents with the communists.

The shape of the pattern has led the more adventuresome of the analysts to cite the possibility that Reuther may be setting himself up to lead elements within the union which have never lost their adulation for John L. Lewis, elements whose feeling is strengthened by the forthright tactics of Lewis in behalf of the miners today.

Meanwhile, Reuther's General Motors section of the union has been unable to agree with the company on terms of a new contract to replace the one expiring Oct. 5. The dispute, therefore, has been certified to the NWLB.

Sought by the union is a program of full employment, guaranteed weekly wages and wage stabilization (prelude to a labor demand for stabilization on an "equal pay for equal work" basis throughout the industry), increased vacations and revised security provisions. Important in this latter demand is the proposal by the union that the company set aside funds to provide for reemployment after the war as well as reconversion.

Another appeal to the board in Washington appeared likely, too, after a panel considering Chrysler contract proposals recommended a number of important changes from past agreements. Chief among these recommendations were a permanent umpire, as operates in General Motors and Ford, a maintenance of membership clause, and a check-off of dues. The industrial representative on this panel dissented from these proposals.

Confirmation of the unsettled feeling reported prevailing in Chrysler plants was implied in one section of the report blaming lack of harmony on the "unyielding and resentful spirit in which each participant blames the other for disputes."

TRAINING and upgrading of non-supervisory personnel continues to be a pertinent problem. Even if the volume of new orders is levelling off, there still remains the difficulty of replacing the continually increasing numbers of men called into service. One of the first reports to be developed by the Automotive Council for War Production on manpower utilization is on such training and upgrading, and its approaches appear to be fairly seasoned.

For non-supervisory training, the first step recommended is the taking of inventory of present personnel divided by skills. Against this should be listed the types of skills needed to staff the plant completely at projected peaks. Comparisons are then in order.

Skills should then be grouped according to their relationship to each other, with the highest skill at the top of the list and the lowest at the bottom. Where shortages exist, needs should be met where possible by upgrading, and by starting new and inexperienced help in the bottom skilled groups, where they should be placed according to previous training or prior experience.

At the same time, a time table should be developed so that a sufficient number of operators will be available without the time lag when needed for production. Training costs and allocation thereof should be arranged, and instructors should be chosen on the basis of personal aptitude, job knowledge and the ability to teach.

The problem, of course, is not that easily solved. If the plant is converting to war work or from one type of war work to another, different skills will be required. Training programs will be determined somewhat by the situation, as well as by the amount of time available. At the same time it is pointed out that man-power shortages can sometimes be met by increasing efficiency in the present working force.

Training of supervisory help should be slanted, the report states, so that each trainee should be ultimately able to supervise and administer matters of policy relating to men, machines, materials and methods. There is required, therefore, a complete knowledge of duties and acceptance of responsibilities, the proper use of authority, thorough knowledge of business policies of the company, a general knowledge of principles underlying the economics of sound business and an appreciation of social conditions and human relations. These can be taught, the report goes on, by conferences, lectures, slide films, movies and actual demonstrations.

Responsibility for the success of any program necessarily is said to rest with the plant manager. The importance of his interest in the program as a determinant for its success is stressed. Departmental supervisors should be made responsible for training of subordinates, the Auto Council blueprint goes on, and probably some one individual with full responsibility to organize and direct the training program could be designated as the training director.

ABSENTEEISM is being importantly reduced at the Detroit plants of the Norge Div. of Borg-Warner Corp., and the incentive is one of pocketbook fattening.

When the War Bond plan was inaugurated in April, absenteeism in the plants approximated 7 per cent among about 2000 employees. The 7 per cent ratio of April has now been reduced to 4.8 per cent. Ten $50 bonds did it.

Employees gather at a designated point at each plant every Friday noon for selection and award. Small tags carrying the numbers of all employees are placed in a round metal container which is then spun around. A girl employee, blindfolded, reaches into the container for a tag. If the holder of the number drawn has a "clean" attendance record without tardiness or absenteeism, he gets the $50 bond then and there. If the record shows absence or tardiness, however, another drawing is made and repeated until the perfect record is found.

Hours and Earnings

April, 1943 (Preliminary)

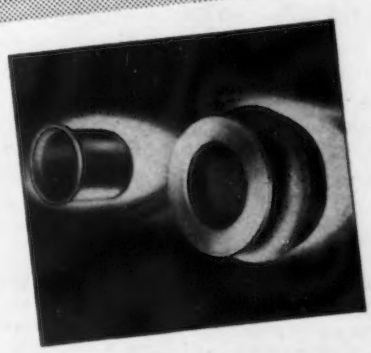
Industry	Number of Plants Reporting	Average Weekly Hours	Average Weekly Earnings	Average Hourly Earnings
Transportation Machinery and Equipment	164	47.5	60.33	1.269
Machinery, Non-Transportation	224	49.6	57.47	1.156
Iron, Steel and Their Products, other than Machinery	148	47.4	54.53	1.148
Non-Ferrous Metals and their products	54	47.3	54.48	1.151
Forest Products	92	47.3	37.53	.793
Stone, Clay, and Glass Products	36	47.2	47.72	1.009
DURABLE GOODS	718	47.8	$57.59	$1.205

How to REDUCE Machine Shut-Down Time

by getting longer runs between grinds

Certainly one of the biggest problems of all-out production is finding ways to prevent loss of machine time caused by frequent shut-downs to redress, regrind or replace tools that wear too rapidly or fail too soon. If *you* could get ten minutes to several hours' extra production time per day from each machine in *your* plant, wouldn't it make *your* production schedules easier to meet?

Many busy war plants have found a way to do just that—by using the Carpenter Matched Set Method of tool steel selection. Because it provides a definite *system* for selecting the one steel that is best for each tool, this method helps to get tools that give uninterrupted production—that run longer between grinds. Given here are two actual production line examples of how it works.



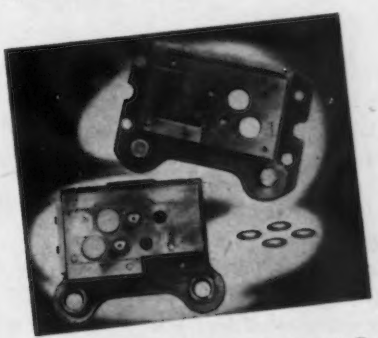
42 More Productive Hours Per Month Per Press

THE JOB: Drawing a bearing retainer out of plain hot rolled steel ⅛" thick. Rated capacity of press, 1,250 pieces per hour.

THE PROBLEM: Oversize wear after 4,000 pieces —replacement of tool with duplicate consumed 1 hour during which press was idle.

THE SOLUTION: A change in tool steels in the direction indicated by Carpenter's Matched Set Method of Tool Steel Selection.

THE RESULTS: An increase in *tool life* from 4,000 pieces to 86,000 pieces per tool. A decrease in press shut-down time of 42 full working hours per month. A gain in production of 52,500 pieces per month.



63.8 More Productive Hours Per Month Per Press

THE JOB: A fast blanking operation on a press operating at 7,200 pieces per hour.

THE PROBLEM: Burrs after every four hours, necessitating 2½ hours shut-down time for pulling the die, regrinding and replacing.

THE SOLUTION: The company switched to the steel indicated by the Carpenter Matched Set Method.

THE RESULTS: An increase in time between grinds from 4 hours to 35.8 hours. A decrease in press shut-down time of 63.8 hours per month. An increase in production of 460,000 pieces per month.

If you are interested in getting more output in *your* plant, the Matched Set Method can help you. A request on your company letterhead will bring you helpful information about it. Or for "on the spot" service, your Carpenter representative will be glad to give you every assistance.

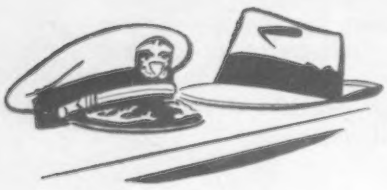
The Carpenter Steel Co., **121 Bern St., Reading, Pa.**

Carpenter
MATCHED
TOOL STEELS

Washington . . .

L. W. MOFFETT

• Bill HR 2795 little help in preventing dissipation of surplus property in government hands when war ends . . . Peace-time industries endangered by possible lack of discrimination which bill affords.



WASHINGTON — While a 10-man Joint Congressional Committee "studies," the Procurement Division of the Treasury can give away enormous quantities of war materials, under the provisions of HR 2795 reported favorably on May 27 by the House Committee on Expenditures in the Executive Departments. Congress is given permission to study while this goes on.

The report and the bill received favorable notice in the press as a case of Congress asserting itself to prevent the dissipation of $50,000,000,000 to $100,000,000,000 worth of surplus property in government hands at the end of the war without Congressional supervision. Actually, as a preventative the bill is a joke.

The bill would empower the President or the head of any agency to determine that property held by an agency is surplus and thereafter so declare it to the Procurement Division. The Procurement Division will then be able to sell the goods in the domestic or foreign market or give it away to foreign governments. The section referred to says "lease" not give but give is the Washington interpretation of "Lend-Lease."

Not only can the President accomplish the foregoing but he can give the property away to any scientific, literary, educational or public health or welfare organization which is supported by state, territorial or federal taxes. This excludes ordinary governmental agencies. The President can order the property destroyed or disposed of "by such other method as it determined to be feasible."

DISCRETION of which would form a loophole through which property could be drained away without Congress, business or the public being any the wiser is given to heads of agencies with respect to damaged property or property worn out beyond commercial repair. They can sell or transfer, give or destroy property of this kind without any limitation merely upon a finding that the property is "damaged," "worn," "without commercial value" or "if the cost of sales would exceed the estimated proceeds." This opens the door to all sorts of fraud and collusion, in the opinion of private attorneys.

However, there really is a little limitation on the property which can be siphoned off. Under the act "war materials" means: "any tangible property owned by the United States or by any corporation owned or controlled by the United States which was acquired or is held or utilized for military purposes, but does not include any land buildings, or their appurtenant facilities or fixtures or any gold or silver."

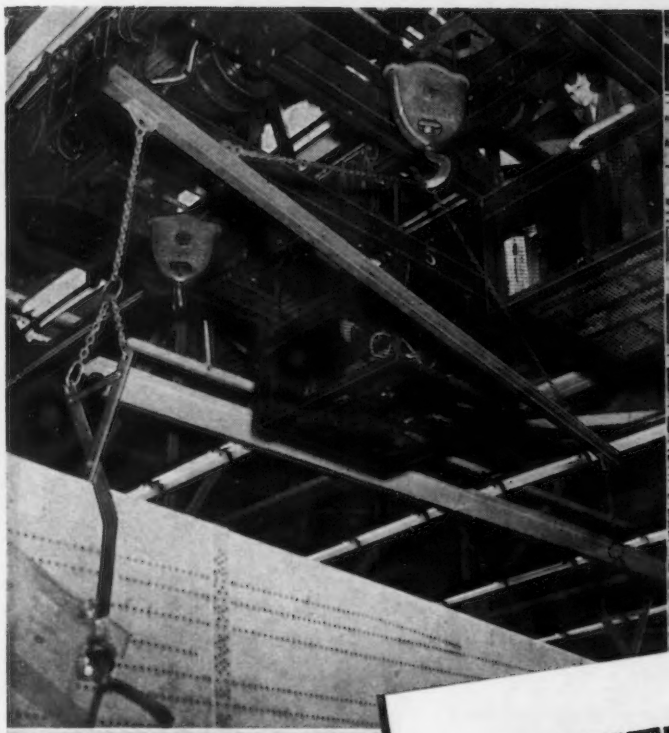
Another inconsequential limitation would restrict the disposition of war material to tax supported organizations and the power of the Procurement Division to sell or otherwise get rid of property "after the date on which the President proclaims that the hostilities of the present war have ceased." The bill also says that these powers can be terminated by future Congressional legislation, but this will be hardly necessary if there is no war material left to be concerned about.

STORIES have been published that the Committee on Expenditures in the Executive Departments had "St. George'd" White House attempts to keep Congress out of the surplus war material question. The original bill, HR 1601 introduced by Representative James A. O'Leary of New York, was certainly no worse from a Congressional standpoint than the bill which the Committee reported favorably, also sponsored by Mr. O'Leary.

Credit for modifications in the new O'Leary bill has gone to Representative Carter Manasco, Democrat of

COAL STRIKE CONFEREES: WLB members leave the White House after conferring with President Roosevelt, Secretary Ickes and War Mobilization Director Byrnes in an exploration of the coal crisis. Left to right are William H. Davis, chairman of the board; George W. Taylor; Reuben Robertson; Wayne L. Morse, WLB compliance officer; Frank P. Graham; Van A. Bittner and Robert J. Watt.

Harris & Ewing



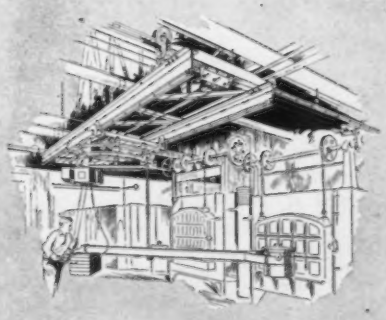
ESSENTIAL EQUIPMENT *Now*

that is your solution to post-war conversion

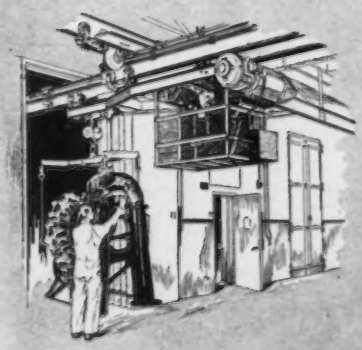
First we must win this war. American Mono-Rail Overhead Handling Equipment is doing its part in increasing war production. American MonoRail equipment is extremely flexible. Standard parts fit quickly and easily into complete systems, offering a wide range of application without costly adjustment or lengthy engineering.

Let our engineers show you how to speed up your war production NOW and at the same time prepare for post-war conversion.

Special Crane for fast quench



Overhead Loop for Quick Pouring



Spotting Motor in Test Cell

THE AMERICAN MONORAIL CO.

13103 ATHENS AVENUE ★ CLEVELAND, OHIO

Alabama. Mr. Manasco deserves more credit than this, though, because he introduced a bill to give industry, Congress and war agency representation on a Surplus War Material Board. However, the Manasco bill was submerged in Committee when it reported the second O'Leary bill.

CONGRESSMEN are impressed by the possibility that $100,000,000,000 worth of surplus war materials may have to be sold after the war. If true, the property would represent about 60 per cent of the cost of government for the past 150 years up to Pearl Harbor. This was $167,000,000,000. It would be more also than the 1929 boom year cost of all manufactures, mining and agricultural products. This only amounted to $82,383,000,000. Moreover, Congressmen remember and fear the repetition of World War I scandals in connection with the sale of government surplusses when there was only about $4,000,000,000 worth left over.

HR 2795 carries no safeguards to prevent the post-war crippling of civilian industries which will be in the throes of reconversion to peace-time production. It does not give Congress and industry an opportunity to protect the American economy. Billions may be lost irretrievably if the bill is passed. There is nothing to prevent the indiscriminate giving away of goods under Lend-Lease or the destruction of export markets.

There is no check on the sharpster who is responsible for the Congressional solicitude to avoid scandal. Officials will be given a tremendous grab-bag with which to purchase political favors while the public foots the bill. Labor will be made to suffer by the bill which contains no safeguard to post-war employment.

Harris & Ewing

BYRNES CONGRATULATES SUCCESSOR: After being sworn in as director of economic stabilization, Judge Fred M. Vinson, left, is congratulated by his predecessor, James F. Byrnes, who was named head of the newly created War Mobilization Office.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

SO THE BULL OF THE WOODS GAVE YOU THE AFTERNOON OFF, DID HE? WHOSE CAR IS THAT YOU'RE WORKING ON?
THE BULL OF THE WOODS'
THE OFF DAY
T. M. REG. U. S. PAT. OFF.
COPR. 1943 BY NEA SERVICE, INC.
J.R.WILLIAMS 6-11

WPB Establishes Two New Industry Advisory Committees

Washington

• • • **The WPB director** of Industry Advisory Committees has announced the formation of the following industry advisory committees:

Electroplating and Anodizing Equipment Manufacturers' Advisory Committee: W. W. McCord, government presiding officer; William E. Belke, president, Belke Mfg. Co., Chicago; S. L. Cole, sales manager, Chas. F. L'Hommedieu & Sons Co., Inc., Chicago; B. G. Daw, president, Lasalco, Inc., St. Louis; O. W. Hakanson, Meaker Co., Chicago; T. W. Kirby, president, A. T. Wagner Co., Detroit; L. K. Lindahl, president, Udylite Corp., Detroit; A. J. MacDermid, president, MacDermid, Inc., Waterbury, Conn.; John M. Mayers, vice president, Frederic B. Stevens, Inc., Detroit; A. P. Munning, vice president, Munning & Munning, Inc., Newark, N. J.; Van Winkle Todd, president, Hanson-Van Winkel-Munning Co., Matawan, N. J.; G. A. Spencer, president, Crown Rheostat & Supply Co., Chicago.

Crown Manufacturers' Industry Advisory Committee: C. P. Kolstedt, government presiding officer; E. J. Costa, Crown Cork & Seal Co., Baltimore; J. C. Feagley, Armstrong Cork Co., Lancaster, Pa.; Robert Mitchell, Mitchell & Smith, Inc., Detroit; Talbot O. Freeman, Pepsi Cola Co., Long Island City, N. Y.; C. P. Edmonds, Bond Mfg. Co., Wilmington, Del.; L. C. McAuliffe, Mundet Cork Corp., Brooklyn; W. P. Murray, Continental Can Co., New York; R. P. Smith, Hoosier Crown Corp., Crawfordsville, Ind.

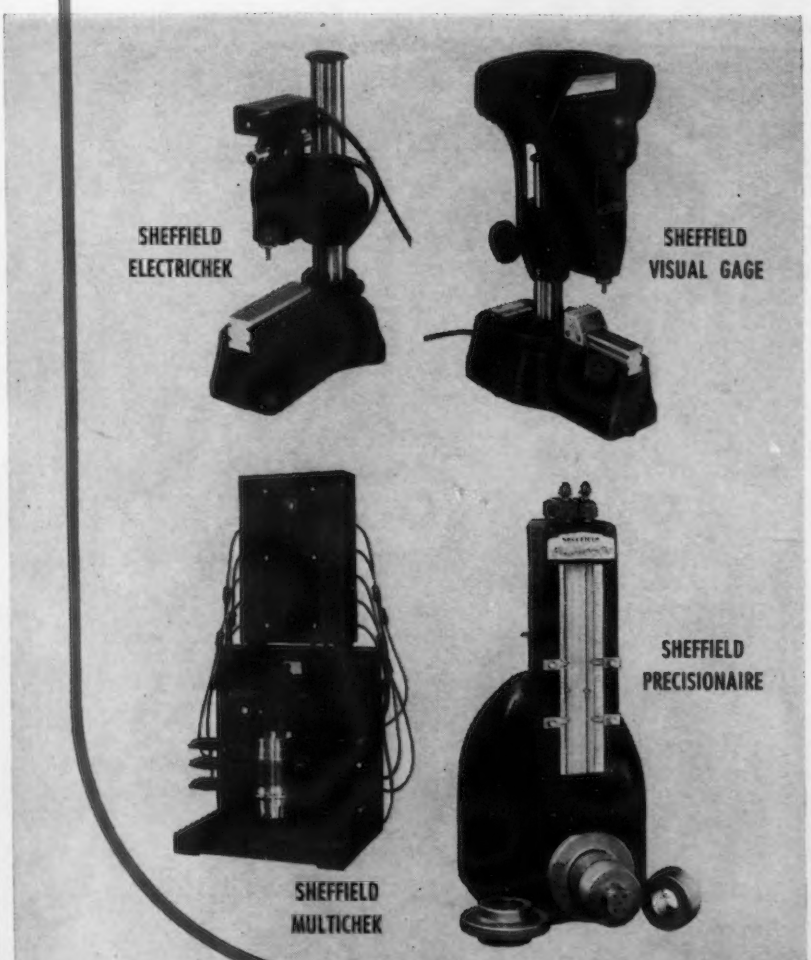
Wallace Named To OPA Industrial Price Work

Washington

• • • **The appointment** of Donald Wallace as one of two acting deputy administrators in charge of the OPA Price Department, temporarily succeeding deputy administator J. H. Galbraith, who resigned, was announced last week by Price Administrator Prentiss M. Brown.

Mr. Wallace, director of the Industrial Manufacuring Price Division and senior division head in the Price Department, will be acting deputy administrator in charge of price activities which include Industrial Manufacturing Price Division, Industrial Materials Price Division, Fuel Price Division, Textiles, Leather and Apparel Price Division, and Services and Consumer Durable Goods Price Division.

don't let faulty inspection cause you to scrap good parts . . . . .



It has been repeatedly found that close tolerance parts rejected by fixed size gage inspection were quite often within limits when checked on a Visual Gage. In other cases, parts accepted by the fixed size gage are rejected by this more precise gaging instrument. The difference is the human factor—skill—experience—temperament—health.

Sheffield Gaging Instruments remove the human factor and in addition provide greater precision and faster inspection all at lower inspection costs. Write for Bulletin No. 43-1 describing the Visual Gage, the Precisionaire, the Electrichek, and the Multichek.

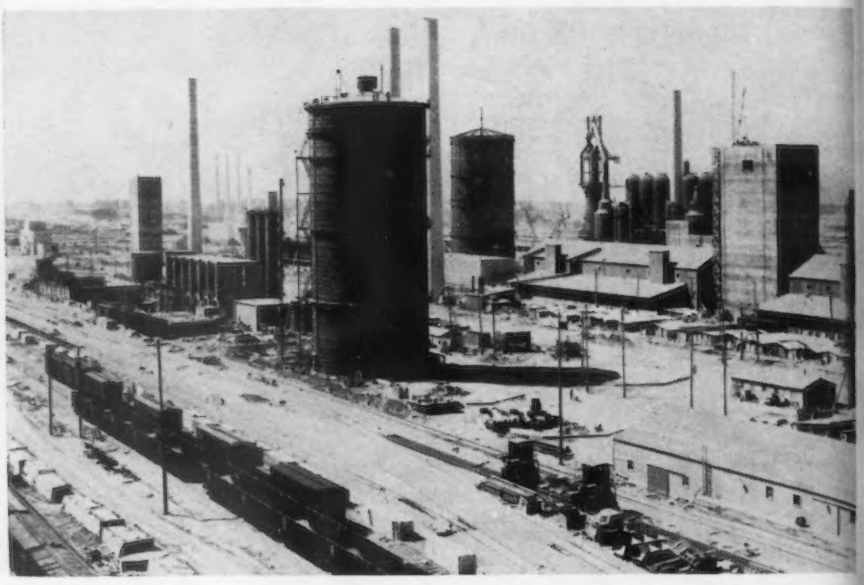
THE **SHEFFIELD** CORPORATION

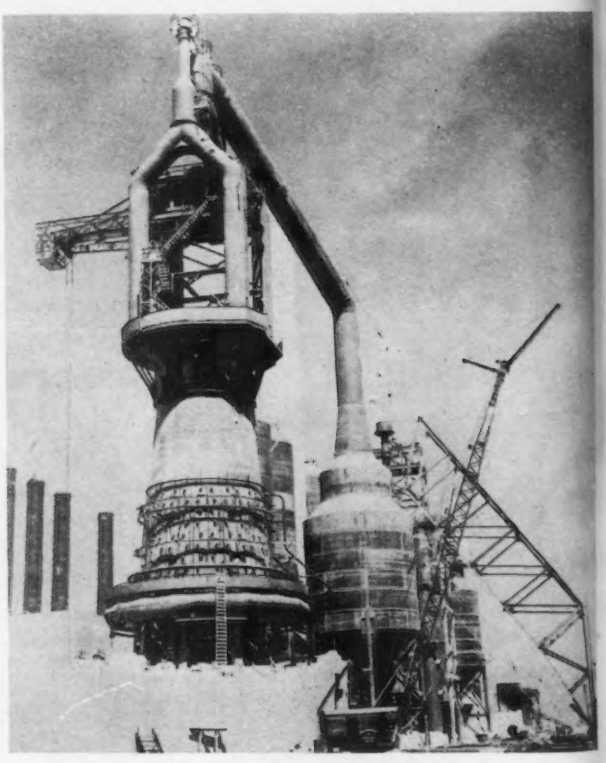
DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES

WEST COAST . . . OSGOOD MURDOCK

• Huge Geneva Works now being built for Government near Provo, Utah, rapidly becoming a "bastion of steel," according to officials of Columbia Steel Co.





"BASTION OF STEEL": The largest, integrated steel mill west of the Mississippi is being built at Provo, Utah by Columbia Steel Co. At the top is the huge by-products plant, and at the right is Number 1 Blast Furnace. The mill will have three such blast furnaces with a capacity of 1200 tons each, and nine open hearth furnaces with a capacity of 225 tons each.

° ° °

PROVO, UTAH—Although completion of the project has been materially retarded by inability to obtain priorities of sufficiently high rank to secure contemplated early deliveries of essential items of equipment, the huge Geneva Steel Works now being built for the Government near Provo, Utah, is rapidly becoming a "bastion of steel," Columbia Steel Co. officials announced last week.

This will be by far the largest integrated steel mill west of the Mississippi, a plant of the most modern design, costing over $150,000,000. It is being erected by Columbia Steel Co., U. S. Steel subsidiary, for account of Defense Plant Corp., a Governmental agency. The plant was ordered by the Government to provide steel for war shipbuilding needs of the Pacific Coast.

While a number of the units comprised in this gigantic plant are ahead of schedule, other phases of construction are behind the original schedule, due primarily to difficulty in obtaining equipment, when desired, because of stringent priority regulations and the need for similar articles in other Government war projects. This priority situation has been improved recently through the efforts of the War Production Board. Another factor which has slowed up work at Geneva to some extent has been a shortage of labor. Unless further delays, not now foreseen, are encountered, the Geneva plant should be completed, ready for operation, by the end of this year.

IN spite of these obstacles, the tremendous size of the Geneva mill with its lofty smoke stacks, towering blast furnaces and other structures protruding from the landscape over some 1,600 acres, is apparent today, now that many thousands of tons of structural steel have been erected to form the numerous buildings.

The Geneva plant will have four batteries of by-product coke ovens, each battery containing 63 ovens. These batteries are now at least 70 per cent completed. The first of the three blast furnaces at Geneva, each having an approximate capacity of 1,200 tons of pig iron daily, is approaching completion and should be ready for operation, if desired, in August.

One building alone, which indicates the immensity of the project, is the continuous plate mill. This mill, now

THE TAMING OF A *Terror*

It took courage— perhaps a driving urge toward an undreamed destiny — for some prehistoric experimenter to handle fire for the first time. The uncontrolled fury of this lightning-kindled terror had raged through his forest home times without number; he knew fire's destructive power. But he braved that fury — picked up a blazing branch and found he could tame the terror, could control for his own purposes the light and heat . . . and later, the power . . . born of the flames.

When we consider the potential destruction hidden in a swiftly turning shaft, and when we reflect how easily and safely that power is utilized through a clutch, we see that we of today have simply gone further along a course whose direction was determined by just such acts as the one pictured here. For man has progressed as he has learned to create and control power to do his bidding.

We are proud that a small part of that progress has been due to our efforts. The Twin Disc Clutch Company has been in business more than twenty-five years, and that quarter century has witnessed marked development in the design and production of clutches for every industrial purpose because Twin Disc Clutch Company has concentrated its activity to this specialized field.

If you are planning machinery to do the work of the future, you will do well to draw on the wealth of experience, and the broad line of standard manufacture clutches, available here. Now is the time to ask questions. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin.

For example: Twin Disc Marine Reverse and Reduction Gears★ are used with power units for standby service to raise or lower a bridge floor weighing a thousand tons.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

under construction, resembles a fortress of steel sentinels—actually row upon row of hundreds of steel columns stretching across the terrain for more than two-thirds of a mile. When the mill is completed, it will be one continuous building 3,750 feet long.

Other indications of the size of Geneva can be gained from the fact that some 70 miles of conduit pipe are becoming part of the slabbing and rolling mills. There will be several steel girders in one of the steel furnace buildings which weigh well over 100 tons each. So large are they that over 6,000 rivets were used to secure reinforcing plates to them. Huge cranes will ride these girders carrying tons of molten steel from the nine open hearth furnaces, each with a steel capacity of 225 tons daily.

SHORTAGE of materials has made necessary the use of great quantities of concrete in place of steel. Four hundred thousand cubic yards of concrete have already been poured into the various structures. Before the project is completed, this figure will approximate 500,000 cubic yards. From one vantage point on the plant site can be seen elevated conveyor ways, coal and ore storage bins, and stacks, all made of concrete, although ordinarily of steel, thus resulting in a conservation of from 25 to 30 per cent of this vital material.

Also winding around the site are miles and miles of railroad tracks, which will service the mill facilities. When completed, 65 miles of railroad tracks will have been laid within the plant site.

In short, Geneva Works, upon completion, will rank among the very largest of manufacturing plants west of the Rocky Mountains.

PRIDE of officials of Basic Magnesium Inc. now operated by Anaconda, finally broke through censorship restrictions last week and won Army approval of announcement that the company's big southern Nevada plant is now the world's largest single producer of magnesium, operating at 85 per cent of capacity. Rumors continue to hint that, despite previous denials, consideration still is being given to an alternate means of transportation of ore to the plant which will eliminate the 1,000 mile rail haul from Luning, Nevada, to the plant via Ogden, Utah. Most often reoccurring is the rumor that a new link will be built in the Tonopah and Goldfield Railroad, now owned by a wrecking company, which will connect Las Vegas with Tonopah and give direct access to the Luning deposit. This plan has also been boosted as an east of the mountains rail line to serve military installations. Some rumors continue to be heard that WPB will approve truck hauling, although this would involve several million dollars' worth of road construction work in addition to manufacture of the necessary vehicles.

Armco Reports Drop in Income of $3½ Million

Middletown, Ohio

• • • **Net income of** $7,780,988, equal to $2.01 per common share, for the year 1942, was reported to stockholders of The American Rolling Mill Co. last week, by Charles R. Hook, president. The largest tax bill in Armco's history, higher labor costs and a refund of $2,500,000 to the government as the result of renegotiation of contracts, accounted for the decline in earnings from the $11,228,475 net income, equal to $3.21 per common share, reported for the year 1941.

The company and most of its subsidiaries enjoyed a record volume of business for the year 1942, with net sales reaching a new high of $180,978,867, compared with $169,178,239 in the preceding year.

M-21 Amended To Fit Full CMP Operation

Washington

• • • **WPB on Tuesday** announced that M-21, the basic order covering the distribution of iron and steel products, had been amended to take care of changes made necessary by full operation of CMP beginning on July 1. Elimination of the preference rating system for deliveries of steel was the principal change made by the amendment. At present steel deliveries are permitted on a preference rating of A-10 or higher.

Under the amended order, steel products may be delivered only on (1) authorized controlled material orders; (2) as permitted by Priorities Regulation No. 13; (3) by CMP regulation No. 4; (4) by orders M-21-B-1 and M-21-B-2, or (5) as specifically directed by WPB.

This does not apply to steel forgings and iron products which may still be delivered on an A-10 or higher rating; as permitted by Priorities Regulation No. 13 and on orders authorized by WPB.

It is made clear by the amended order that second quality material and shearings of all types are subject to the same control as prime material but that the terms "steel" and "iron products" do not include used material or steel which has been recovered from used material. The order consequently, for example, covers shearings produced at a steel mill or croppings recovered from shipyard operations are covered by the order but if sold as scrap the material is not controlled by the order.

The amended order also changes the method of identifying purchase orders to terms of CMP Claimant Agencies from the former system of group classifications.

A. M. Wibel Added to Nash-Kelvinator Staff

Detroit

• • • **Reshuffling of top administrative personnel at Nash-Kelvinator Corp. took place last weekend.**

Joining the company as a vice-president was A. M. Wibel, who resigned a few weeks ago as purchasing director of Ford Motor Co. Indications in a statement by George D. Mason, Nash-Kelvinator president, were that Wibel would operate in a wider sphere than purchasing, and will be particularly concerned with a new and as yet unrevealed large war contract of the company.

The resignations of W. F. Armstrong and F. R. Pierce were announced. As vice-president, Armstrong has administered manufacturing and sales operations, and Pierce has been vice-president in charge of sales. No successors were announced.

Gries Resigns WPB

Washington

• • • **George G. Gries,** vice president of Great Lakes Steel Corp., has resigned from the WPB Steel Division to return to his company. Mr. Gries, who has served as executive consultant to the director of the Steel Division, has more recently been assigned as chief of the Division's sheet, strip and bar branch.

U. S. Grand Jury Indicts Carnegie-Illinois on 47 Counts

Pittsburgh

• • • **A United States Grand Jury** here last week indicted the Carnegie-Illinois Steel Corp. on 47 counts charging the false certification of tests on steel supplied to the Maritime Commission, the Navy, and Lend-Lease.

This is the second indictment of the company, the first having covered the charge of destroying certain records. Lawrence S. Dahl, general superintendent of the company's Irvin Works, was also indicted with the company in the second general indictment.

YOUR POSTWAR PLANNING

AND VICKERS

HYDROMOTIVE CONTROLS

While postwar plans cannot now be precisely determined, it is clear that one need is for improved products to keep manufacturing at a high level and provide the work necessary to maintain the American standard of living.

After the war, business must be won against stiff competition in practically every field. Present models of many machines will be made obsolete by others with important improvements that cannot be ignored.

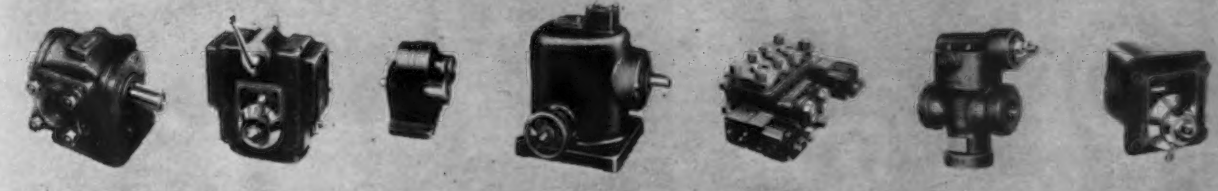
The exceptional versatility of Vickers Hydromotive Controls provides unusual opportunities to the machine designer . . . opportunities for far-reaching improvement in the important fields of better control—higher production rates—wider utility—greater safety—elimination of operational difficulties.

Your postwar planning is undoubtedly now underway. Vickers Application Engineers will welcome opportunities to cooperate with you.

VICKERS *Incorporated* • 1420 OAKMAN BLVD. • DETROIT, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS · CONTROL ASSEMBLIES · FLUID MOTORS · VARIABLE DELIVERY PUMPS · DIRECTIONAL CONTROLS · PRESSURE CONTROLS · VOLUME CONTROLS

Fatigue Cracks . . .

A. H. DIX

Relief for Silent Sufferers

• • • We foresee a sizeable postwar market for a device that will provide controlled noise for use in soundproofed plant offices. In many of the new manufacturing cathedrals the acoustics experts have wrought so wonderfully that nary a decibel of sound escapes from plant to offices.

The tomb-like stillness is bound to be disturbing to a man who has spent practically all his life within earshot of the comforting whir of machinery, and if you walk in unexpectedly on a brass hat in a fancy new soundproofed office you might catch him cupping a nostalgic ear in the hope of hearing a friendly rumble.

The gesture is mainly reflexive, of course. The heavy order books tell him that the plant *is* running. But when backlogs no longer reach from here to infinity the unnatural quiet may make him neurotic, for the brass hat brought up in an atmosphere of plant noises associates stillness with death and decay. And here is where the controlled noisemaker comes in. It will provide whatever plant sounds the customer has become conditioned to—a lulling whir, a satisfying clang-thump, a muted screech, or a symphony.

The principal sales obstacle will, of course, be pride. The prospect will be reluctant to admit that the absence of the noises he used to hear in his old office is making him jittery. This obstacle can be overcome by explaining tactfully that although too much noise is distracting, too much silence has been known to drive men mad. The bull fiddler may never be called upon to take bows, but when a sore thumb prevents him from spreading his soothing cushion of background sound, the whole band looks bad.

Soldered Ships

• • • A. W. M. sends us a clipping from the *Binghamton (N. Y.) Press* of a lady reporter's account of a visit to a Scotch shipyard. He underscores this:

> On the ways and decks of barges, girl welders were soldering plates.

He adds, "She means 'pasting.'"

Aptronym

• • • Stan (The Assembly Line) Brams, your Detroit task force, was up Bay City way the other day. To prove it he sends us a clipping of an ad in the *Bay City Times*, revealing that a funeral home there is conducted by M. Ralph Stiff.

Top-Shelf Reporting

Which reminds us to pat our modest Detroit editor's back for his brilliant X-ray of the Ford Motor situation. See page 70 of last week's issue. If Pulitzer prizes were handed out in our part of the publishing field, we would play this to win.

Vacation—On Expense Account

• • • A junket is a trip made ostensibly for business purposes, but actually just for the ride. A junketer is a person who takes such trips, whether in private or public employ. Leon Wesley Moffett, your Washington periscope, improves on the word:

> WPB also did the most traveling, a great deal of which, it is suspected was junketeering. For this category WPB billed John Q. Taxpayer for $1,029,387.

Junketeering has a much more ominous sound than *junketing*. It has better balance and rolls off the tongue more smoothly, and we favor its immediate election to the language, for it is a pat word to describe a pastime that is growing in popularity.

All God's Chillun Got Know-How

• • • Current love of advertising writers is, as you have noticed, the phrase "know-how." They play with it as fondly as a girl twiddles a new engagement ring. *"Know-how speeds production for buyers of . . ."—"New 'Know-how' to Help You"—"Know-how Cuts Cost of Making. . . ."*

Constant exposure to the phrase so obsessed L. F. Willmott, of the Wellman Engineering Co., Cleveland, that he began to see little know-hows in his sleep. To exorcise them he called on his muse, and this is what came out:

What, no know-how?
How come, no know-how?
Anyhow, get to know us, we've got the know-how!
Do you know how we know how we've got the know-how!
We always did know? No, Howe told us!
Do you know Howe? N. O. Howe?
Anyhow, if you don't get to know us
And our know-how, get to know Howe
And Howe's know-how. And how!
How's about it?
'Cause you can't get nowhere today
Without the know-how.
No, sir, no how.
Know-how, know-how
Know-how
Know-how . . . . . Bah!

Rancor to Love

• • • We squawked to a certain government department about what we regarded as unfairly discriminatory treatment. The guvment admits the truth of our charge and lays the blame squarely on the doorstep of the crowd in the northwest corner of the floor. We quote:

> It is true that . . . of Iron Age has been limited somewhat more than contemporary journals. This is only due to the fact that your editorial material contained information that is much newer and up to date than other journals.

We don't recall ever having been more mollified.

Shine Little Glow Worm

• • • Next to Wendell Willkie's "One World" our favorite reading matter is a fat, red book of letters the brains department has received from arsenals, navy yards, aircraft plants, and others in our section of the industrial social register.

They aren't love letters—just letters received in the ordinary course of business, but revealing a reader interest that causes us to light up like the glow worm mentioned in this letter just received from a thirster for knowledge:

> Can't get away from learning what's going on. Enclosed $2 for some copies of your journal Iron Age.
>
> As usual some here had iniquity instead of so much ritual. Had a wrong opinion of me. Interested in my ambition 21st of year till October. Then I go on my way—there's a will there's a way. Earn what we can. Being what we are. Shine like a glow worm, if we cannot as a star.
>
> *H. L. M.*

Squawk

> An issue or so ago, you were whimsically critical of Madame Chiang Kai-Shek's use of four-cylinder words. What in hell do you mean by "arcane?" Your loyal reader No. 19 has less trouble with the puzzles.
>
> *Wm. P. MacDonald,*
> *Shepard Niles Crane & Hoist Corp.*

"Arcane" is one of the words that never sticks to us either. We have to look it up at least once a month and after a couple of days it gets away from us again. It means secret, mysterious, as in Royal Arcanum.

Puzzles

Last week's hunter packs his 1.7 yd. gun in a flat square case 1 yd. on a side. The diagonal length is 1.73 yd.

If you can get this one before the ice in your Tom Collins melts you have earned a second one:

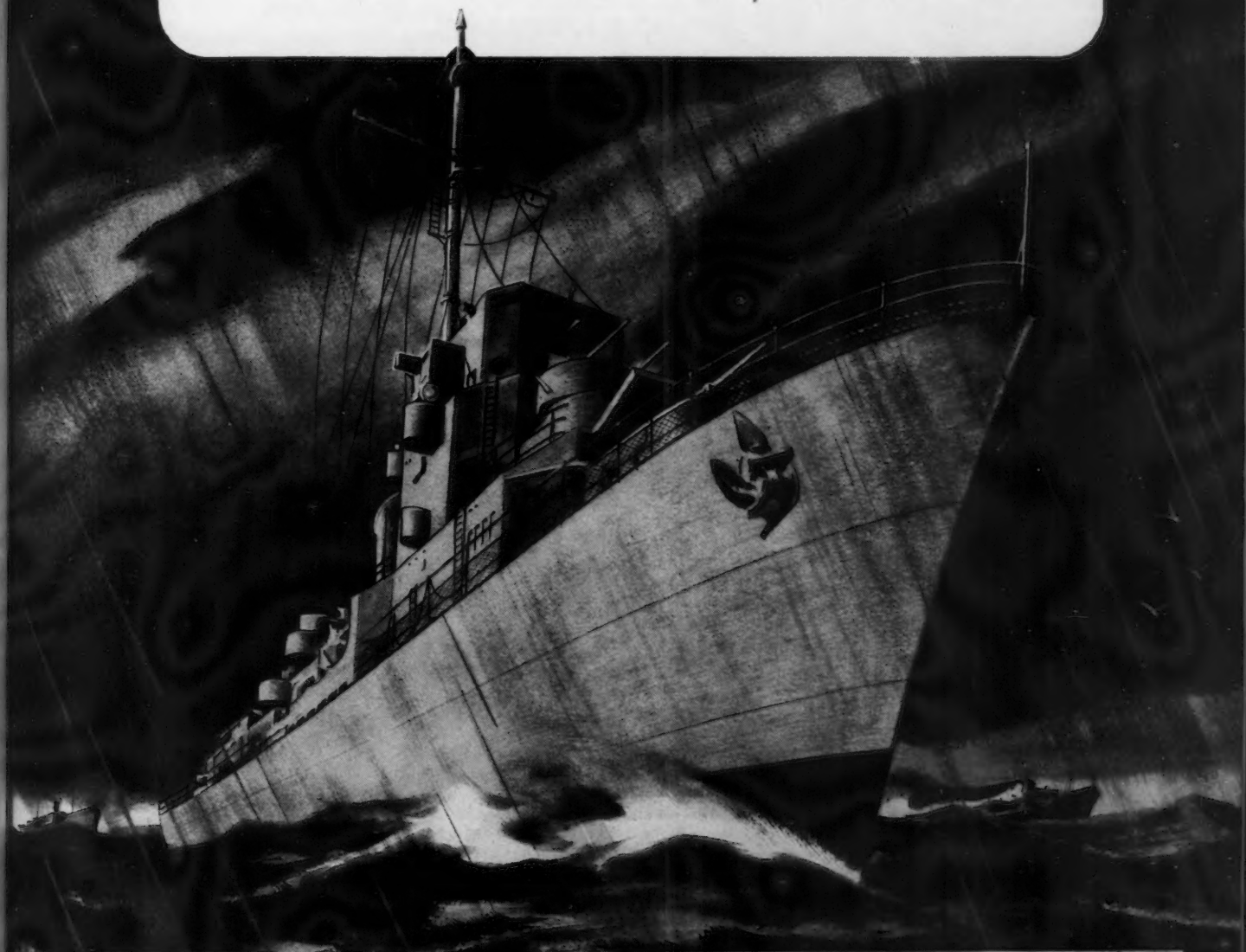
Three men—Arthur, Bernard, and Charles—with their wives—Ann, Barbara, and Cynthia—make some purchases. When their shopping is finished each finds that the average cost in dollars of the articles he or she has purchased is equal to the number of his or her purchases. Arthur has bought 23 more articles than Barbara, and Bernard has bought 11 more than Ann. Each husband has spent $63 more than his wife. Who is the husband of whom?

300 feet of "Lightning" that knows how to strike!

"D-E" Boat is what the Navy calls her! She's a Destroyer Escort—300 feet of "lightning" built to dish out what it takes to make Axis "wolf packs" wish they had stayed home.

Slim, sleek, and deadly, the D-E's are propelled by Diesel engines and manned by crews who know how to do the job assigned them.

Many of the Diesels for Destroyer Escorts and other U. S. Navy warships are of Fairbanks-Morse manufacture. The skill, facilities, and engineering experience that have given Fairbanks-Morse Diesels a world-wide reputation for dependability are now being used to provide dependable power for U. S. Navy craft—when dependability is so important. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.



FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES
WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

Diesels

Dear Editor:

NAMELESS CHILDREN

Sir:

We folks would like—quick—500 reprints of Mr. Van Deventer's editorial last week, "Nameless Children." His comparison is priceless and we wish to spread the story among our people who are not generally exposed to THE IRON AGE.

HENRY BOOTH,
Vice President
Shawinigan Products Corp.,
Empire State Bldg.,
New York

BROKEN GRINDING WHEELS

Dear Miss Dase:

Your letter on page 80 of the May 27 issue, regarding broken grinding wheels, interests me. You ask, "Can anyone suggest anything?"

In answer, I am sending you a complimentary copy of a textbook entitled, "Grinding Wheels and Their Uses," and also two copies of the Safety Code for the Use, Care and Handling of Grinding Wheels.

I hope that you will find many things in the textbook of interest in connection with your work, but please turn first to page 414 Appendix C, which is entitled "Wheel Breakage and Safety Tips." After you have read this short article on the subject, turn to page 418 which is a reproduction in tabular form of the causes of grinding wheel accidents which I can assure you are by no means as general throughout industry as they appear to be in the shop where you work.

HARRY B. LINDSAY,
Secy.-Treas.
Grinding Wheel Mfg. Assn.,
27 Elm St.,
Worcester, Mass.

MAGNAFLUX

Sir:

I am quite sure I saw an advertisement in your paper quite a long time ago describing some rather inexpensive device with which you can see a crack in a piece of steel which is not visible to the naked eye. We wish you would give us some information as to where the device can be purchased.

J. F. ALEXANDER,
President
Crotty & Co.,
Parkersburg, W. Va.

● Magnaflux Corp., 5908 North Northwest Highway, Chicago.—Ed.

DERMATITIS PREVENTIVES

Sir:

Is there some agent that can be used in the cutting oils used in operating our automatic screw machines, and also an agent to be used in soluble oils used in a centerless grinder, which will eliminate skin infection?

E. S. WAINWRIGHT,
Purchasing Agent
Automatic Materials,
Cary Ave.,
Staten Island, N. Y.

● Several manufacturers make disinfectants of the phenol type to be added to cutting oils and soluble oils. Among these manufacturers are the West Disinfecting Co., Orchard St., Long Island City, N. Y.; Huntington Laboratories, Huntington, Ind., and Merck & Co., Rahway, N. J. Phenol type disinfectants are diluted in the proportion of about one part to every 400 parts of cutting oil. Another type of cutting oil disinfectant is Nytol, made by the United States Sanitary Specialties Corp., 59 East 12th St., N. Y. The Milburn Co., East Woodbridge and Walker Sts., Detroit, makes protective creams, which are widely used in the industry to prevent dermatitis through contact with cutting oils. These creams are rubbed on the hands and arms of the operator and are sometimes referred to as "invisible gloves."—Ed.

MACHINE HOUR BURDEN RATES

Sir:

I am looking for a bit of information for comparative purposes on the subject of "Machine Hour Burden Rates" for various classes of machines. I am wondering if THE IRON AGE might have a composite chart of the various types of machines used in the average shop, showing the machine hour burden rate by class of machine.

C. E. HUMER,
Chief Cost Accountant
York Safe and Lock Co.,
York, Pa.

● See the "Cost Accountant's Handbook," published by Ronald Press Co., 15 East 26th St., New York. It contains data on all factors that enter into machine hour rates. Also see "Establishing Relative Burden Rates on Machine Hour Bases," by Fred O. Coudart, published Dec. 1, 1941, by the National Association of Cost Accountants 385 Madison Ave., New York.—Ed.

SHIP WELDING

Sir:

Would it be possible to obtain just a very brief summary of the types of welding used on a Liberty ship? The interest is in the percentage of electric welding and acetylene welding and whatever brazing done on an average Liberty ship.

WAYNE L. FREY
Siebring Mfg. Co.,
George, Iowa

● Practically all steel welding on Liberty ships is arc welding. In the yard way about 20 per cent of the welding done on the sub-assemblies on shore is by the Unionmelt submerged melt automatic arc process. The rest is manual arc welding, either d.c. or a.c.

During the last six months there has been a trend toward the wider use of a.c. transformer-type welders. There is also a growing use of multiple operator constant potential d.c. generator sets, off which 12 to 20 men may work at a time. About 120,000 to 140,000 lb. of arc welding electrodes is used per EC-2 Liberty ship.

About the only place acetylene welding is used is for silver soldering and brazing of copper piping, of which there is a considerable amount used in each vessel. Usually every plate that enters a Liberty ship is cut to size and shape by the oxy-acetylene cutting torch. In most cases, this work is done with automatic machinery capable of cutting three or four plates at once. It is interesting to note that the consumption of oxygen used for cutting is equal to the cubic content of the vessel itself.—Ed.

ARC WELDING ELECTRODES

Sir:

We are much interested in the article comparing arc welding electrodes in the May 13 issue of your excellent journal. We would appreciate one reprint, if available.

WALTER M. MITCHELL,
Chief Metallurgist
York Safe and Lock Co.,
York, Pa.

● Since the tables were published, several omissions have come to light. The tables are being revised and reprints will be available shortly.—Ed.

CORRECTION

Through a typographical error, the address of the Linde Air Products Co. was given in last week's Dear Editor page as 30 E. 60th St., N. Y. The correct address is 30 E. 42nd St.—Ed.

NE STEEL CHART

Sir:

Please mail to Stout Skycar Corp. six copies of THE IRON AGE NE Steel Standard Steel Chart. If there is an extra charge for these copies, please bill us for them.

G. R. SCOTT,
Manager, Engine Development
Stout Research,
2124 South Telegraph Rd.,
Dearborn, Mich.

● Price is 25c each.—Ed.

Sir:

I have seen a copy of the NE Steel Wall Chart and it appears to me to be a very welcome addition to the relatively meager information available on NE Steels. Would you please forward me a copy of this Chart for use in my office.

A. E. VOYSEY, Major, Ord. Dept.
Assistant Shop Officer
Watertown Arsenal,
Watertown, Mass.

ATKINS, TOO

On page 80 of the May 27 issue you have listed a number of manufacturers under the heading "Chain Saws," but our name is conspicuous by its absence.

Perhaps it is our fault that you are not acquainted with the fact that we are manufacturing a power chain saw, but I might say in passing, that if you were as zealous in keeping in touch with what we manufacture, as we are in reading your "F.F.J." this omission never would have occurred.

For your further enlightenment we enclose a circular describing our Power Chain Saw.

So there!

M. W. DALLAS,
Advertising Manager
E. C. Atkins & Co.,
Indianapolis, Ind.

● We blush with shame.—Ed.

Close tolerance forgings can Make time for your assembly line

● Close tolerance forgings usually require *less time to machine and finish* and therefore indirectly increase the capacity of both machines and men employed on finishing forgings. Close tolerances are, in part, the result of knowing how to match forging hammers and the skills of forging craftsmen to the requirements of each forging job. Forging to close tolerances is a standard practice in T & W Forging Shops. T & W forgings, formed to close tolerances, can *make time for your machining line* in the production of aircraft units and armaments at a faster rate. A T & W Forging Engineer can point out many other important advantages which T & W forgings offer.

Forging to close tolerances is the standard practice in T & W Forge Shops where the skill of forging craftsmen and the performance of hammers in a wide range of capacities are known to management.

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at the Point of Assembly

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STEEL FORGING CORPORATION • ALLIANCE, O.

SALES OFFICES: NEW YORK, PHILADELPHIA, CHICAGO, INDIANAPOLIS, DETROIT AND CLEVELAND

This Industrial Week . . .

- **Coal Strike Costs 50,000 Tons of Steel**
- **Steel Production Lowest Since Late '41**
- **48-Hr. Week May Jeopardize Production**
- **Rules for Termination of Contracts Needed**
- **Component Scheduling Procedure Issued**

WITH coal again trickling out of the mines, units of the steel industry are making a slow recovery from the effects of last week's strike which caused the loss of 50,000 tons of steel needed for war. While the battle between John L. Lewis and the federal government goes on, spurred by Lewis' new deadline of June 20, the steel industry's attention is divided between a number of pressing matters such as the reflections in its production schedules of shifting war strategy (typified by the layoff of 800 persons at the Gary armor plate mill, which is expected to affect 1400 before the end of this week because of the cutback in the tank program) and the 48-hr. work week.

The blast furnaces which were shut down due to lack of coal lost about five days' output which cannot be made up. Steel production this week is down 2½ points to 94.5 per cent, lowest since late December of 1941. In May the steel industry produced 7,545,379 net tons of ingots, slightly under the all-time March peak, according to the American Iron and Steel Institute, and operated at 98.4 per cent of capacity. Significantly, electric furnace steel production reached a new all-time peak of 398,057 tons.

The coal strike will make it difficult for some steel production units to meet the quotas which WPB established for them for June and may be responsible in part for tighter steel mill schedules for months to come. In connection with the latter situation, furnace repairs on a larger scale than occurred last Summer also will be another factor.

THE 48-hr. week in steel can be shrugged off by many persons as they turn to more interesting reading matter, but it is a vital subject to all connected with the industry. Labor hiring practically is frozen in steel, most companies are in a position where they cannot hire new workers, and WPB directives are not always sufficient to supply 48 hr. per week per man on some steel finishing units. There are possibilities that the industry may find itself in a trying position in a few months, with some output jeopardized.

In the minds of manufacturing executives engaged in war production, questions surrounding the settling of accounts when hostilities cease are foremost. If the recent cutbacks in armament items are a sample, considerable confusion and much anxiety may be created unless the government takes steps now to avoid them. The cutbacks have brought to the front the likelihood of long delays in negotiations, and such problems as what constitutes inventory material, what a reasonable inventory consists of, and whether certain regulations are at loggerheads with other rules.

Will legal wrangling prevent the release of large sums of money needed for post-war production? This is the main fear of many industrialists, who are striving to get the government to establish definitions and rules for the windup of war contracts. It is not too early, nor is it unpatriotic to be thinking ahead along this line, say the executives.

THE Ordnance Department, attempting to settle contracts which have been altered or cancelled, has found one chief hampering factor to be a lack of modern and uniform accounting systems in numerous contracting plants, which makes necessary minute and careful checks all along the line. Meanwhile, WPB has been endeavoring to work out a fair plan for the termination of war contracts and has been studying a tentative termination clause.

Manufacturers of machine tools are understood to be protected 100 per cent on work in process in the event of cancellation of pooled contracts issued by the Air Force. Faced with the certainty of dwindling government orders, machine tool makers are pushing ahead with their conversion plans. In the hands of the new WPB Facility Committee lies the power to say yes or no to new machine tool orders of the Army and Navy. It plans to break up the hoards of tools held in reserve (600 machines were reported found in storage in one plant) and to eliminate certain instances of duplications of facilities.

Applying to a limited group of items needed for ships, tanks and the most urgent types of war construction, the new system for flowing components has been issued by WPB under the name Component Scheduling Procedure. Claimant Agencies and their prime contractors are expected to program for several months into the future, indicating their requirements for control components to the full extent of the future program. Provision is made for a 24-month program.

News Highlights in This Issue

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Other recent priorities developments have been numerous, and more changes are coming. Beginning with fourth quarter there will be a change made in the processing of applications for materials and allotments of materials for Class B products. Monthly percentage restrictions have been eliminated from CMP Regulation No. 1.

A new directive to CMP Regulation 1 states that undelivered steel from the second quarter must be carried over to third quarter. WPB announced that new steel production directives will include both a minimum and a maximum amount which a mill is expected to produce in a given month. WPB is understood to be framing an amendment to CMP 4 which will tighten up warehouse and distributor acceptance of orders for critical materials.

Layoffs in a number of aircraft divisions are reported this week and may be augmented by further temporary halts. . . . Foundry circles report that government officials are developing a procedural directive for the welding of magnesium castings. . . . One steel company after years of aggressive sales work has stopped pushing a product generally sold for highly specialized operations where a pure iron base was needed. . . . Production of cemented carbides is still on the increase, with a sizable gain scheduled between now and September. . . . Gilding clad metal scrap is piling up in the nation because there is insufficient processing being done to separate the copper from the steel. . . . Several Senators are said to have filed a petition with James F. Byrnes, director of the new OWM, requesting that C. B. Wilson of WPB be added to the War Cabinet to strengthen the hand of Donald M. Nelson. . . . The Steel Recovery Corp. expects to wind up in the next few months its remaining stock of strictly "cats and dogs" presumably in unwanted sizes and gages. . . . Producers of Lake Superior iron ore and Great Lakes vessel operators are keeping their fingers crossed when they discuss the current season with its high goal of 91,000,000 gross tons, the reason being that poor weather on the Lakes can raise hob with schedules.

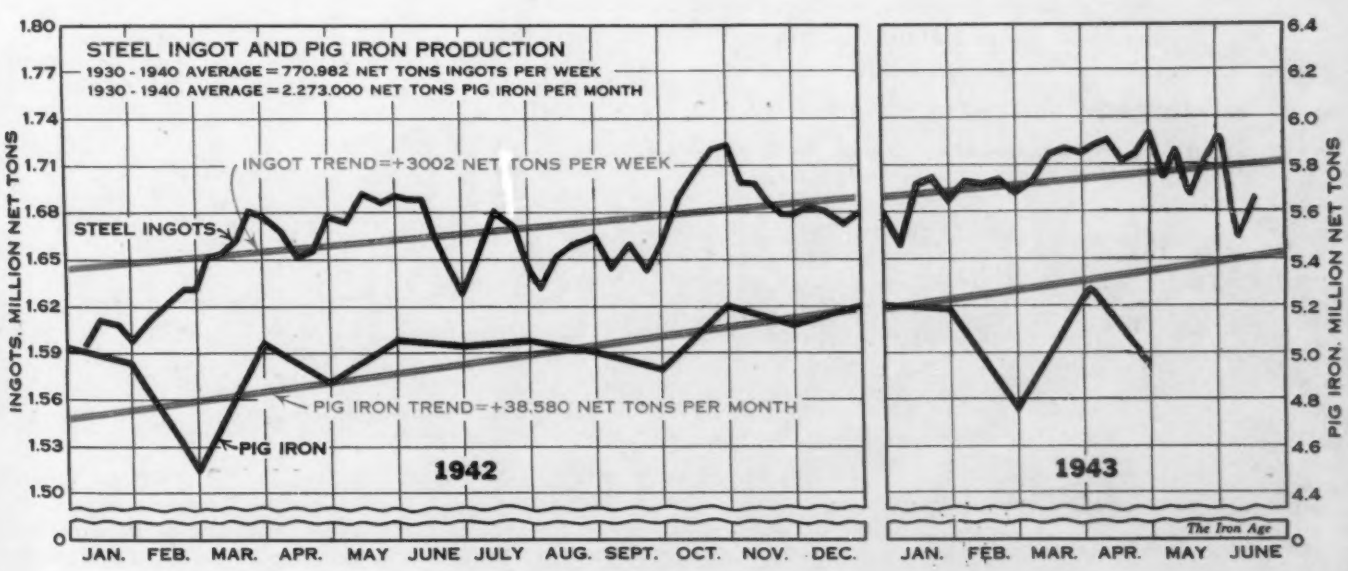
Tank Armor Mill Laying-Off 1400

Chicago

• • • Indications that tank armor plate manufacture has caught up with the demand for this product were evidenced this week in the laying-off at Carnegie-Illinois' Gary works of some 800 with total layoffs expected to reach 1400 before the end of the week. Of a total employment of 2300 at the Gary armor plate mill, the layoff will leave only 900 employees. The layoffs will be absorbed in other departments as fast as possible. The mill was engaged almost solely in the rolling of tank armor and the cutback is a natural result of the cutback in the tank building program. There is the likelihood, Ordnance Department officials stated, that other types of work will go into the mill, but nothing definite has been set. Just what the mill and buildings will be used for is at present quite speculative.

STEEL ingot production in Pittsburgh decreased this week seven points to 88 per cent while in Youngstown it dropped two points to 95.5 per cent. In Philadelphia, the operating rate fell half a point to 92.5 per cent and in Cleveland steelmaking was lowered by three points to 97 per cent. Also down are operations at Wheeling which declined by four points to 85 per cent; at Birmingham, down three and a half to 99; Detroit, off four and a half to 93.5 and Cincinnati, one point to 102 per cent. Chicago at 97, St. Louis at 99 and Eastern district at 101 per cent are all unchanged.

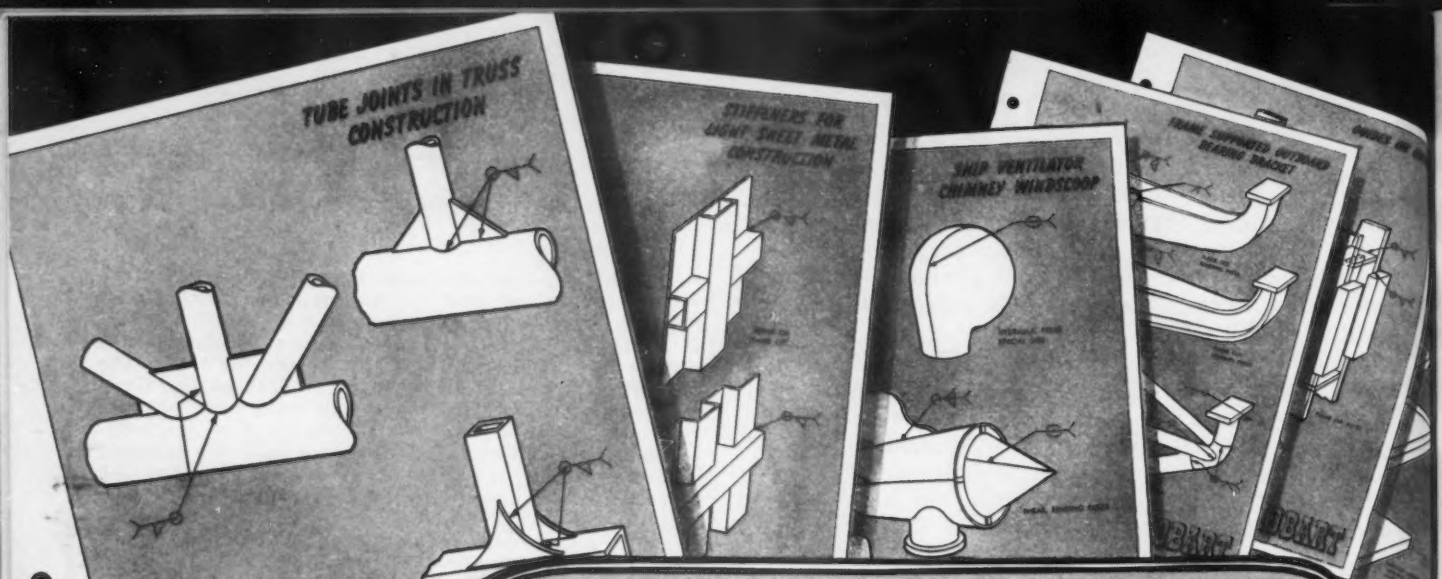
The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	S. Ohio River	St. Louis	East	Aggregate
June 3	95.0*	97.0	97.5*	93.0	100.0*	106.5	89.0	102.5	98.0	102.0	103.0	99.0	101.0	97.0
June 10	88.0	97.0	95.5	92.5	97.0	104.5	85.0	99.0	93.5	102.0	102.0	99.0	101.0	94.5

* Revised



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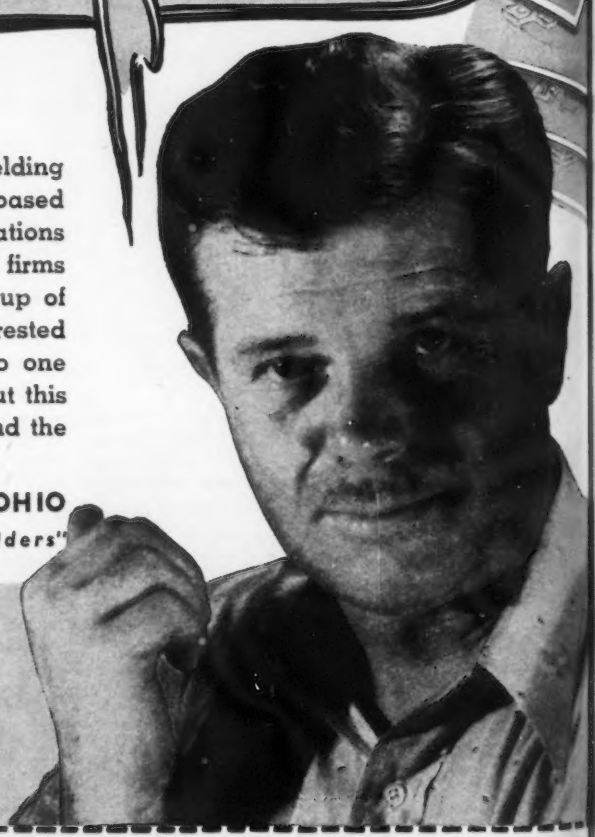

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You'll marvel at the profitable suggestions your engineering staff will find applicable to your problems, though the idea may have originated in an entirely different field of activity. No one interested in modernizing production, processing, construction or maintenance of equipment should be without it.

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We are planning to modernize our product with the new Arc Welding. Please register and mail to the name and address below the initial units of Hobart "Practical Design for Arc Welding" service—no cost or obligation.

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Firm Name_____

Address_____

☐ Check here for delivery schedule of Hobart Welders. _____ Priority available.

☐ Send me your new Welder Catalog.

Steel Believed 60 to 65% on 48-hr. Week; Labor Shortages Expected to Result; Red Tape May Hurt Production

News of Industry

Pittsburgh

• • • **From Maine to California** the steel industry is now working under the War Manpower Commission order No. 8 requiring that no new employees may be hired unless all employees in all departments, not specifically exempted, are working a minimum of 48 hr. a week. Surplus labor because of going to the 48 hr. week can be used to fill up the holes left by induction or regular turnover, but by Aug. 1, this surplus labor must be released.

The announcements which appeared in some newspapers over the weekend that the steel industry was ordered on a 48-hr. week by the various regional WMC directors is believed to represent merely the implementation of General Order No. 8 by these regional directors. The order called for the beginning of the 48-hr. week as of June 1, but important instructions and interpretations were not available at that time and were a few days late in reaching some mills and some regional districts.

By July 1, all steel companies must have in the hands of their regional WMC director a "released list" of all employees who represent surplus labor as a result of going to a 48-hr. week completely. By Aug. 1, all steel companies must furnish 48 hr. of work a week to all employees except those who will come under the exemptions. Before any employee is released, or hired, or exempted as a result of the 48 hr. ruling, approval must be obtained by the steel company from the WMC regional director. He cannot give his approval until he has consulted with the collective bargaining agency in the plant affected. This, it is believed, will cause considerable loss of time, argument, etc.

With labor hiring practically "frozen" throughout the steel industry and with most companies in a position where they cannot hire new people, a serious question has arisen as to what will happen if mills find they cannot produce specific production directives of the War Production Board. All steel companies have been going to the 48-hr. week as rapidly as possible but the extension of the final effective date to Aug. 1 indicates that it will take at least another month and a half for companies to adjust their work schedules.

Several steel plants in the Pittsburgh district and probably most companies elsewhere now have from 60 to 65 per cent of their forces on a 48-hr. week. With armed forces inductions expected to be extremely heavy within the next six weeks and with normal turnover in the steel industry running about 4 per cent a month, there may be cases of serious labor shortages in isolated spots before the full 48-hr. week schedule is reached for all employees. The red tap necessary to go through in order to hire new employees before the full 48-hr. week schedule is reached may take so much time that production loss might materialize.

As repeatedly pointed out in past issues of THE IRON AGE, a large amount of "down-grading" will be inescapable in reaching the 48-hr. week for all employees. Some of this has already occurred and will in the future, increase the number of grievance controversies between steel companies and the union. On down-grading for a specific job where an employee has to take a different and lower rate under the 48-hr. week schedule, there will probably not be too much trouble. However, in cases where an employee will be on his regular job for say 40 hr. a week and on a lower paid job to round out the 48-hr. a week, observers look for considerable controversy. The union has taken the stand that the employee should not be paid a rate lower than his regular rate although there is nothing in the WMC rulings to support this view.

The steel industry has not out and out opposed the 48-hr. week but has consistently taken the stand that sufficient time should be given to allow the imposition of the rulings so that they will cause the least amount of production disturbance. The industry, however, has opposed the stipulation that the WMC regional director must consult with the collective bargaining agency in the plant before employees are released, hired, or exempted in carrying out the WMC 48-hr. ruling.

"SOS" CAMPAIGN: Employees of the Marine Turbine Division of General Electric's Erie Works have reduced spoilage and waste 20 per cent in the first four months of their campaign to expedite production of marine equipment by reducing spoilage losses.

It seems certain that no steel company is going to allow production to be affected by the red tape involved in coming under the 48-hr. week. Steel must be produced under WPB directives and orders and that is believed to be more important than the manpower arguments.

48-hr. Week Order Condemned by Tower

Washington

• • • Walter S. Tower, writing for the Steel Industry Advisory Committee addressed a letter June 2 to Mr. H. G. Batchellor, director, Steel Division, WPB, expressing serious concern over the 48-hr. week directive in the Steel industry. Mr. Tower's letter said in part:

"The committee has not had time to explore all of the possible effects of the regulation but preliminary studies indicate that the apprehensions set forth in the statement presented to the chairman of WMC on May 13th were fully justified.

"The regulation purports to define and interpret but it only confuses. It fails to answer most of the practical operating problems which have been clearly pointed out by the industry in statements to the commission.

"The industry has repeatedly declared its approval of the 48-hr. week or any number of hours that may be necessary to produce enough steel to win the war. Your Advisory Committee has earnestly sought to cooperate with WMC to the end that the 48-hr. week could be made effective without retarding production in any way.

"That committee has submitted detailed suggestions based on practical experience in scheduling and operating steel plants. It hoped that these suggestions would be included in the commission's formal instructions but, in the main, they have been disregarded. Actually, the instructions as issued fail to clarify and, in some cases, fail to mention at all certain provisions of vital importance to uninterrupted production.

"Specifically, the regulation requires steel companies to get the permission of the regional directors of WMC in all cases of exemption from the 48-hr. week or in the hiring of all new employees. These regional directors, it is assumed, would consult with the regular established management-labor advisory committees. However, the regulation requires that they must consult in each specific case with the union which is the collective bargaining agency in the particular company involved.

"Consider what that means. In order to keep mills operating at current capacity levels, the steel industry must hire about 20,000 new workers monthly to provide for the turnover, which is averaging about 4 per cent monthly. This turnover is expected to increase sharply with greater inroads of the draft. Already the industry is having difficulty in finding the thousands of new workers it must have monthly. That difficulty will be multiplied if, indeed, the task is not made impossible by the delays and restrictions that will result from WMC's instructions.

"In fact, it is the committee's considered opinion that this regulation will have the effect of setting up a vast unworkable bureaucracy which must inevitably seriously interfere with steel production. Its operation is bound to result in confusion, delays and failures of operating schedules to the point that the industry's war effort will be imperiled.

"Because of WPB's responsibility for maintaining maximum production of steel in the interests of the war program, your advisory committee feels an obligation to submit further detailed suggestions as soon as it is possible to analyze the regulation. If adopted, these suggestions should result in regulations for the proper application of the 48-hr. week in the steel industry. They will have but one objective—maintenance of capacity production of steel and full utilization of man-power."

BATTLE-CRY: Production gets a boost at the New Departure Division of General Motors Corp., Bristol, Conn., when such "straight from the shoulder" messages come from employees in the armed services

"Keep increasing that flow of production. New Departure bearings are a big part of our armed forces.
Keep 'em rolling,
New Departure"
Here's one—
Straight from the Shoulder!
Dick says:
We will do our best to win this war—but we need help from folks back home. Stay on the job and
KEEP THOSE BEARINGS ROLLING

Order Constructive, McNutt Says

Washington

• • • Though denying at first that there is anything unique in requiring that labor be consulted on hiring policies of steel companies, War Manpower Chief Paul V. McNutt on Monday admitted under close questioning by reporters that no other government agency had ever made such a rule which is a requirement in the 48-hr. regulation. Mr. McNutt further said that this rule had not been embodied in previous WMC orders and might not be continued in future ones.

Mr. McNutt defied anyone to show that any WMC order had been detrimental to production. He maintained that all such orders have been constructive. His comment was that it was nothing new for WMC to request consultation with labor and management. This, he said, has been a WMC policy for a long time.

Mr. McNutt said that he had received no formal protest from the steel industry. The steel industry at a meeting in Pittsburgh on Thursday of last week drafted a protest against the 48-hr. regulations and addressed it to H. G. Batcheller, director of the WPB Steel Division. Mr. McNutt's statement would indicate that the protest had not as yet been brought to his attention.

Going Rates Set for Labor in Ohio Area

Cleveland

• • • **The first action** in establishing brackets of "sound and tested going rates" necessary in clarifying the President's "hold-the-line" order fixed the temporary minimum rate for common labor in a number of areas in Ohio, Kentucky, and West Virginia. These rates are subject to expansion and revision by the Regional War Labor Board from time to time, and minimum and maximum brackets for other jobs are being worked out at the present time.

The minimum "sound and tested going rates" for common labor are:

District	Rate, Cents per Hr.
Cleveland	70
Youngstown	70
Warren	70
Canton	70
Toledo	70
Dayton	70
Akron	70
Columbus	65
Cincinnati	60
Covington, Ky.	60
Newport, Ky.	60
Louisville, Ky.	55
Ohio areas not covered	55 to 65
Kentucky areas not covered	50
All of West Virginia	55 to 65

Under the Byrnes directive, the brackets are to provide "clear cut guides and definite limits as a basis for correcting sub-standards of living and as a basis for permitting the board to make within the existing price structure and within existing levels of production costs, minimum and non-inflationary adjustments deemed necessary to aid in the effective prosecution of the war or to correct gross inequities within the meaning of Section 1 of the Act of Oct. 2, 1942." The rates in these brackets will generally be regarded as stabilized rates and not subject to change except as permitted by the "Little Steel" formula. Rates may be raised up to the minimum.

In addition to bringing more wages up to the minimum of the brackets, the Regional War Labor Boards may also handle:

(1) Intra-plant adjustments necessary to do equity and promote production.
(2) Applications by employers not under the Fair Labor Standards Act to pay time and a half for over 40 hr., or to change from a fluctuating to a fixed work week to compute overtime as permitted employers not under the act.
(3) Adjustments for improvement of working conditions that do not involve increasing basic rates and which do not exceed the prevailing practice in the industry or area. These include vacation pay, sick leave plans, night shift bonuses, and holiday pay.
(4) Application of the Little Steel formula to individuals or small groups where such application would afford an equitable and expeditious method of disposing of the case. The rule has been to apply the Little Steel formula only to the largest appropriate group.

No increases that furnish the basis either to increase prices or to resist otherwise justifiable reductions in prices, or raise the level of production costs, can be put into effect without further approval from the Director of Economic Stabilization.

•

Non-Union Workers Get Time and a Half Pay Grant

• • • **The H. C. Frick** Coke Co., Pittsburgh, has been authorized to pay time and a half to all non-union employees for work in excess of 35-hr. per week performed on the sixth consecutive day of the work week the National War Labor Board has announced. The non-union employees, about 750 out of the total payroll of 25,000, are day rate and monthly salaried employees, largely in supervisory capacities.

•

NWLB Approval Not Needed To Equalize Women's Wages

• • • **Adjustments to equalize** the wage or salary rates paid to women with rates paid to men for comparable work may still be made without board approval under the "Hold-the-Line" Executive Order of April 8, the NWLB announced last Friday.

WLB Chairman William H. Davis in a letter to Secretary of Labor Frances Perkins said in part: "The Order permits an employer, without prior approval from the Board, to make adjustments "which equalize the wage or salary rates paid to females with the rates paid to males for comparable quality and quantity of work on the same or similar operations, provided that such adjustments shall not furnish a basis either to increase price ceilings or to resist otherwise justified reductions in price ceilings."

•

NWLB Prevents Wage Increase Loopholes

• • • **In order to prevent** certain employers from violating the spirit and intent of the wage stabilization program, the NWLB has tightened the restrictions around individual wage and salary adjustments which can be made without Board approval.

Individual increases may not be made without Board approval after May 31, unless they are within a salary or wage rate schedule which conforms to one of the following conditions:

1. Such a schedule was specifically approved by the War Labor Board;
2. It is contained in a collective bargaining agreement in existence on May 31, 1943;
3. It conforms to the employer's practice prior to Oct. 27, 1942. The employer can demonstrate this either through his payroll records or by showing that he has formally communicated such a schedule to his employees.

If employers do not have a plan for making individual adjustments, they can apply to the Board for approval of one.

Payrolls in Steel at High Level in April

• • • **Payrolls of the steel industry in April were $133,275,000, according to the American Iron and Steel Institute. In March a record of $136,813,000 was paid out.**

The number of employees in April totaled 634,000 as against 637,000 in March and 654,000 in April a year ago. The average work-week of wage earners in April was 42.5 hours per week, unchanged from March but higher than the April 1942 average of 39.7 hours per week.

Average hourly earnings of wage earners increased to a new peak of 111.2c. per hour in April, as compared with 110.3c. per hour in March and 100.4c. per hour in April of last year.

Been working much overtime lately, Mr. Schuster?

Idle Furnaces Prepare to Resume after Coal Strike Ends In Truce; Much Steel for War Output Lost Forever

Pittsburgh

• • • **The miners** returned to work early this week under a new 15-day truce following a strike of five days, but not before thousands of tons of steel were lost to war production requirements. This steel cannot be made up.

Last Friday Carnegie-Illinois Steel Corp., due to its meager supplies of coal, was forced to bank 11 blast furnaces in the Pittsburgh district. Two furnaces at the company's Mingo plant was barely holding on after one unit was forced down.

At press time it appeared that the 11 furnaces would not resume full production before Wednesday of this week, thereby reflecting a loss of approximately five days in urgently needed pig iron production. The shutdown of almost half the company's Pittsburgh district blast furnaces forced a temporary suspension of Bessemer steel production and caused open hearths to dip more heavily into scrap reserves due to an increase in the scrap charge.

While other steel companies in the district were not affected as far as steel production was concerned, the strike caused a depletion in coal and coke supply, the effect of which will probably be felt throughout the balance of the year. It is significant that the district is still operating under the possible threat of another strike after the present truce end if a contract does not materialize.

Beehive coke plants were charged early this week after a five-day loss in production. Coke unloaded from the oven on Monday this week, it is hoped, would reach steel plants this Wednesday or Thursday. One merchant pig iron furnace was forced down at Sharpsville, Pa., while one at Struthers, Ohio, may be kept on if coke is obtained by Wednesday of this week.

The Pittsburgh district ingot output rate for last week before the effects of the strike became known, was estimated at 100.5 per cent. Because of the pig iron lost, a revised rate for last week took the district down 5½ points to 95 per cent of rated capacity. This loss in steel production is roughly estimated at 20,000 tons. While it is too early to estimate the loss in production this week, due to the blast furnaces still being out of production early in the week, it is believed that the rate may sag to 88 per cent of rated capacity. This will represent an additional loss in steel production for this week which cannot be made up.

A few blast furnaces were forced down in other parts of the country, namely, in the Alabama district where Republic Steel Corp. was forced to take one unit off.

Press Association, Inc.

ON COAL STRIKE FRONT: Miners of Montour Mine No. 10, Library, Pa., relax and play cards June 1 as the soft coal mine strike continued.

o o o

Settlement Before June 20 Pushed

New York

• • • **As the** nation's 530,000 coal miners prepared to return to work early this week, there were strong beliefs in some quarters that an agreement would be reached ending the wage controversy for the duration of the war.

The policy committee of the union has set a new strike truce deadline for June 20, and the threat of a third stoppage within less than two months hangs over the dispute.

If a settlement comes soon it probably will be within the bounds of a formula suggested by Secretary Ickes, Solid Fuels Administrator. That plan provided for temporary agreement on the issue of portal-to-portal pay, with a commission to be appointed to survey travel time in the mines and furnish the basis of a permanent solution. Within that formula, the miners proposed a $1.50 a day settlement, but the operators rejected it.

The operators are eager for quick accord. A heavy burden of back pay is accumulating under the provision making final settlement retroactive to the original contract expiration date of March 31.

It is reported that all operators are now inclined to feel that speedier and more satisfactory agreement may be reached if the negotiations are left entirely in the hands of the original negotiators.

In addition to steel the strike last week threatened output of benzol for aviation gasoline and synthetic rubber, and chemicals for explosives, plastics and medicines.

Possible Wage Pattern Set For National Agreement With Coal Miners

Chicago

• • • A $1.50 a day increase, which amounts to portal-to-portal pay, for 23,000 Illinois mine workers was agreed to Monday, June 8, by District 12 of the United Mine Workers of America and the Illinois Coal Operators Association, pending ap-

See Coal Strike story on Page 108

proval of the War Labor Board. Retroactive to April 1, this agreement brings portal-to-portal pay for the first time into the coal mining industry and sets a pattern for the national coal negotiations now in process.

The announcement that the Illinois operators and the union had agreed to negotiate a new contract separate from that of the Eastern miners now deadlocked under John L. Lewis came from Gov. Dwight H. Green. Apparently, coal will continue to flow from Illinois mines in spite of any disagreement that Lewis may have with Eastern operators.

The decision of raising miners wages $1.50 a day still hinges on many if's and and's and while it is a step toward settlement of the coal dispute, it can be sidetracked by many powers that be. In the first place, the War Labor Board has to approve the raise under the guidance of the Director of Economic Stabilization. With the roll-back in prices and the salary stabilization plan, it is difficult to determine on what basis the raise can be made since the raise is over the 15 per cent allowed in the "Little Steel" formula.

In addition, the national organization of United Mine Workers must approve the move and it was because of the National Organization's demand for $2.00 a day increase that negotiations have been deadlocked.

1,250 Tons of Iron Lost from One Stack

Birmingham

• • • Approximately 1250 tons of basic iron in this district were lost to the nation's war effort by the coal mine strike.

That is the amount that No. 1 blast furnace at the Thomas Works here of Republic Steel Corp. would have produced had not it been banked the night of June 3 because of inadequate coal supplies. The stack was back in production June 5.

J. & L. and Whiting Waive Royalties on Patent

Pittsburgh

• • • As a special contribution in furtherance of the war effort of the foundry industry, Jones & Laughlin Steel Corp. and Whiting Corp., until further notice, have waived payment of royalties by licensees in connection with the use of Bessemer Flame Control in the operation of side-blow converters for the production of steel castings. This action was as of April 1, 1943.

In 1940, Whiting Corp. was appointed by Jones & Laughlin to negotiate licenses under the Jones & Laughlin patent (No. 2,207,309) for the use of electric eye control equipment for the production of steel for castings in side-blow converters. The original application of the method covered by the patent had been limited to the large bottom-blow Bessemer converters used in steel mills, but after some modification by Whiting Corp. of the equipment used in the mills, the electric eye is now serving in the operation of small side-blow converters.

U. S. and Canadian Ore Shipments Down Slightly

Cleveland

• • • Shipments of Lake Superior iron ore from upper Lake ports during May were 10,918,990 tons from U. S. ports and 55,682 tons from Canadian ports, totaling 10,974,572 gross tons, a decrease of 1,702,684 tons from the total of 12,677,356 tons for May last year, when U. S. ports shipped 12,622,872 tons and Canadian ports shipped 54,484 tons, according to report of the Lake Superior Iron Ore Association.

Cumulative total for the season to June 1 was 12,873,807 gross tons from U. S. ports and 55,682 from Canadian ports, or a total of 12,929,489 gross tons, a decrease of 8,397,575 tons from the same period a year ago when U. S. ports shipped 21,204,656 tons the first five months and Canadian ports shippped 122,408 tons, making a total of 21,327,064 gross tons.

Minor Strike Hits Republic Steel Plant

Cleveland

• • • A strike of 35 cranemen on Thursday, June 3, on the first shift at the blooming mill and other departments of Republic Steel Corp.'s Cleveland plant halted production of more than 500 workers and threatened to involve stoppage of work of at least 2000 men when it ended Thursday evening.

The strike started in a request for increased tonnage rates by cranemen in the bar mills but ended before serious damage to production resulted which threatened to curtail blast furnace operations and halt steel production at the open hearth department.

Inland Steel Takes Over Hillside Fluorspar Mines

• • • **Inland Steel Co.** has taken over operation of the Hillside Fluorspar Mines in Rosiclare, Ill., through purchase of all the capital stock of the company, having completed negotiations on June 1. The company will continue to be operated as a separate unit, with no changes in its general policies, and its acquisition will not alter the plan of serving other companies, which, along with Inland, have been supplied by the mines.

New officers of the Hillside company will be: President, Clarence B. Randall, who is vice-president of Inland; vice-president, P. D. Block, Jr., assistant vice-president of Inland; secretary, J. H. Morris, Inland's secretary; treasurer, W. D. Truesdale, treasurer of Inland; manager of operations, A. J. Cayia, general superintendent of the Inland Lime & Stone Co., Manistique, Mich.; and, manager of sales, Gordon W. Hughes, sales manager of Inland Lime & Stone.

H. W. Hurst will continue as general superintendent at the company's operating office in Rosiclare.

The Hillside company was founded in 1919 by the late G. H. Jones, a cofounder and large stockholder in Inland Steel Co. Since his death in 1941 the Hillside stock has been held in trust by the First National Bank of Chicago.

Industry Facility Committee Gets Power to Veto Orders for Machine Tools

Washington

• • • **Machine tool** manufacture in the next 12 months may be slashed as low as 25 per cent of the $1,000,000,000 worth produced in 1942, Government officials say. Only critically needed tools will be built. These include different types of shapers, grinders, planers and drilling and boring machines. (See THE IRON AGE of May 27, page 128).

The reason for this deep cut in production is that WPB has determined and is convinced that the tools already made will be adequate for military needs, if properly distributed.

To back up this decision, WPB has issued Directive No. 23 of June 2, delegating to the new industry facility committee power of saying yes or no to proposed new machine tool orders of the Army and Navy. "Yes" won't be said until WPB is satisfied all tools are occupied to the fullest possible extent. Also, the committee has been given complete dominion over the movement of machine tools in the order creating it. It plans to break up the hoards of tools held in reserve over the country by the Army and Navy as emergency reserves. These tools will be distributed to plants needing them.

To assist in the redistribution of tools, there is being set up in RFC a new subsidiary to warehouse idle tools. The new corporation will acquire tools from the Army and Navy and financial return from the rental of the equipment will be made to it. George H. Johnson, who recently left his post as director of the Machine Tool Division, will become a vice-president of the corporation. Mr. Johnson is president of the Gisholt Machine Co., Madison, Wis.

The heavy curtailment of machine tool production, including the cancellation of orders, was ordered by WPB Executive Vice-Chairman Charles E. Wilson. Mr. Wilson has been opposed by various factions within the government, including the WPB Machine Tool Division, the industry and parts of the Army and Navy.

The situation which is reported to be responsible for Mr. Wilson's action was as follows: (1) Nearly a year ago, trade sources began to say that the country was tooled up; (2) new programs such as aviation gasoline, synthetic rubber, aluminum, magnesium and steel had to have machine tools; (3) the ordering of new tools for these programs when there were supplies of them lying idle all over the country did not seem sensible, nor economical of time or money; (4) the same reasoning was applied to tools already ordered.

An example of how the industrial facility committee is doing is that of the Norden bombsight plant. The committee has found that the Norden plant is a duplication of the Sperry plant. So one plant is being dismantled and the tools removed and redistributed. The committee is engaged in similar concentration of other munitions plants and many tools are going to be returned to active use, or stored in the RFC warehouse.

WPB investigations have disclosed that some weapon makers have not taken care of tools. Companies have had them set up without proper foundations. Tools have been stored in old buildings on sand floors, and have been exposed to the weather and have become rusty. Some tools which have been produced since the beginning of the war need rebuilding as a result of operation by inexperienced men. One prominent Detroit tankmaker was found to have 600 machine tools of various kinds in storage, some of which had not been uncrated. WPB is going to take care of situations like these.

On the matter of conversion of companies to other war work, WPB officials say that machine tool facilities have been put to work on such items as valves which are critically needed for strategic programs. Warner & Swasey Co. has a contract for marine gun mounts, and other companies are getting into less profitable fields.

Women Play Role in Ore Grading

Hibbing, Minn.

• • • **Last fall Oliver Mining Co.,** U. S. Steel subsidiary, saw indications of a manpower shortage in its iron ore laboratories. At that time through the cooperation of the junior college here and the Chisholm High School, Chisholm, Minn., two training courses in laboratory manipulations in each school were offerred to interested women.

At the opening of the present ore season not more than 34 of the 65 men chemists and analysts were available. Members of the four training classes constitute most of the women now employed by the Oliver Co. at their laboratory here.

The first group of trainees consisted of 24 women, most of them married whose husbands had either gone into the Army or expected to be called. All had had some courses in chemistry, previous to the refresher course in laboratory manipulations last winter.

To these women fall the duties of making determinations of iron, manganese, phosphorous, neutralizing samples of iron ore for alumina and manganese determinations, filtering, removing residue from beakers, burning filter paper from silica and taking dust count. Upon their efforts depend accurate grading of iron ore cargoes for the steel making facilities of the lower lake ports.

Plate Shipments 1,114,920 tons in May

• • • **May shipments** of steel plates totaled 1,114,920 net tons, compared with 1,121,647 net tons in April, and 1,012,194 net tons in May, 1942. The record for plate shipments in any one month was set in March, 1943, when 1,167,679 net tons were shipped.

Included in the May shipments were 535,528 net tons produced on continuous strip mills which have been converted to plate. Strip mill shipments in April were at an almost identical figure, 535,548 net tons, while a total of 425,211 net tons were shipped from strip mills in May, 1942.

American shipyards during May delivered into service 175 new ships totaling approximately 1,782,000 deadweight tons, the Maritime Commission announced. This brings the total number of vessels constructed in 1943 to 711, totaling 7,142,122 deadweight tons—only 35 ships less than the total production for the entire year of 1942 when 746 vessels were delivered.

Of the 175 ships delivered in May, 120 were Liberty ships, 12 were C-type cargo, 12 were coastal cargo, 12 were commission tankers, three were private tankers and six were special type. Four ore carriers were built.

Bars and Plates Top April Output

(Source: American Iron & Steel Institute)

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons							
					Current Month				Year to Date			
					Total	Per cent of capacity	Shipments Export *	Shipments To members of the industry for conversion into further finished products	Total	Per Cent of capacity	Shipments Export *	Shipments To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	44	1	xxxxxxx	678,780	xxx		201,105	2,667,539	xxx		778,836
	Heavy structural shapes	10	2	5,412,580	312,041	70.1		xxxxxxx	1,286,688	72.3		xxxxxxx
	Steel piling	3	3	338,000	2,749	9.9		xxxxxxx	5,466	4.9		xxxxxxx
	Plates—Sheared and Universal	21	4	9,189,740	1,070,060	141.5		2,080	4,327,977	143.2		14,938
	Skelp	6	5	xxxxxxx	59,787	xxx		34,904	265,220	xxx		139,781
	Rails—Standard (over 60 lbs.)	4	6	3,629,260	136,279	45.6		xxxxxxx	611,137	51.2		xxxxxxx
	Light (60 lbs. and under)	6	7	309,690	16,099	63.2		xxxxxxx	50,153	49.2		xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	2,547	30.4		xxxxxxx	10,578	31.5		xxxxxxx
	Splice bar and tie plates	13	9	1,120,270	57,796	62.7		xxxxxxx	219,230	59.5		xxxxxxx
	Bars—Merchant	41	10	xxxxxxx	516,724	xxx		93,674	2,386,306	xxx		300,578
	Concrete reinforcing—New billet	15	11	xxxxxxx	24,563	xxx		xxxxxxx	147,459	xxx		xxxxxxx
	Rerolling	17	12	xxxxxxx	7,918	xxx		xxxxxxx	31,221	xxx		xxxxxxx
	Cold finished—Carbon	23	13	xxxxxxx	149,788	xxx		xxxxxxx	583,262	xxx		xxxxxxx
	Alloy—Hot rolled	21	14	xxxxxxx	262,431	xxx		42,535	990,932	xxx		154,164
	Cold finished	18	15	xxxxxxx	39,174	xxx		xxxxxxx	155,661	xxx		xxxxxxx
	Hoops and baling bands	4	16	xxxxxxx	7,290	xxx		xxxxxxx	29,159	xxx		xxxxxxx
	TOTAL BARS	64	17	14,775,325	1,107,888	91.1		136,209	4,324,000	89.0		454,742
	Tool steel bars (rolled and forged)	18	18	202,040	22,222	133.7		xxxxxxx	80,174	120.6		xxxxxxx
	Pipe and tube—B. W.	15	19	2,236,040	114,189	62.1		xxxxxxx	436,416	59.3		xxxxxxx
	L. W.	8	20	845,400	47,105	67.7		xxxxxxx	193,326	69.5		xxxxxxx
	Electric weld	7	21	1,149,250	93,259	98.6		xxxxxxx	328,283	86.8		xxxxxxx
	Seamless	15	22	3,082,400	186,261	73.4		xxxxxxx	710,359	70.1		xxxxxxx
	Conduit	7	23	190,000	5,629	36.0		xxxxxxx	20,886	33.4		xxxxxxx
	Mechanical Tubing	11	24	597,800	65,071	132.3		xxxxxxx	248,080	126.2		xxxxxxx
	Wire rods	20	25	xxxxxxx	91,163	xxx		19,809	396,568	xxx		82,375
	Wire—Drawn	41	26	2,366,150	163,116	83.8		4,183	656,541	84.4		18,928
	Nails and staples	19	27	1,116,640	71,679	78.0		xxxxxxx	289,579	78.8		xxxxxxx
	Barbed and twisted	15	28	482,280	20,953	52.8		xxxxxxx	79,194	49.9		xxxxxxx
	Woven wire fence	16	29	778,060	18,370	28.7		xxxxxxx	64,750	25.3		xxxxxxx
	Bale ties	12	30	128,420	9,820	92.9		xxxxxxx	35,336	83.7		xxxxxxx
	All other wire products	8	31	78,220	5,551	86.2		xxxxxxx	21,155	82.2		xxxxxxx
	Fence posts	10	32	115,065	1,343	14.2		xxxxxxx	6,722	17.8		xxxxxxx
	Black plate	10	33	339,700	21,468	76.8		-	94,384	84.5		-
	Tin plate—Hot rolled	5	34	508,620	1,605	3.8		xxxxxxx	6,953	4.2		xxxxxxx
	Cold reduced	10	35	3,816,340	16,547	53.4		xxxxxxx	655,951	58.3		xxxxxxx
	Sheets—Hot rolled	25	36	xxxxxxx	494,436	xxx		17,964	2,064,610	xxx		62,380
	Galvanized	14	37	xxxxxxx	70,899	xxx		xxxxxxx	274,606	xxx		xxxxxxx
	Cold rolled	14	38	xxxxxxx	124,087	xxx		xxxxxxx	498,355	xxx		xxxxxxx
	All other	14	39	xxxxxxx	29,977	xxx		xxxxxxx	123,473	xxx		xxxxxxx
	TOTAL SHEETS	28	40	13,497,570	719,399	64.8		17,964	2,961,044	66.7		62,380
	Strip—Hot rolled	22	41	3,200,890	131,460	49.9		17,011	518,539	49.3		56,309
	Cold rolled	39	42	2,057,340	97,933	57.9		xxxxxxx	373,912	55.3		xxxxxxx
	Wheels (cast, rolled steel)	5	43	424,820	19,351	55.4		xxxxxxx	74,225	53.1		xxxxxxx
	Axles	6	44	453,470	14,789	39.6		xxxxxxx	56,230	37.7		xxxxxxx
	Track spikes	11	45	308,350	13,504	53.2		xxxxxxx	51,251	50.5		xxxxxxx
	All other	5	46	42,000	18,168	525.7		xxxxxxx	68,083	409.3		xxxxxxx
	TOTAL STEEL PRODUCTS	160	47	xxxxxxx	5,564,981	xxx		433,265	22,196,829	xxx		1,608,379
	Pig iron, ferro manganese and spiegel	26	48	xxxxxxx	726,736	xxx		329,660	2,977,344	xxx		1,413,247
	Ingot moulds	5	49	xxxxxxx	84,171	xxx		xxxxxxx	315,742	xxx		xxxxxxx
Iron Products	Bars	10	50	170,110	7,485	53.5		301	33,474	59.8		1,309
	Pipe and tubes	2	51	106,000	7,753	88.9		xxxxxxx	31,177	89.4		xxxxxxx
	All other	1	52	56,000	1,501	32.6		-	5,784	31.4		-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	xxxxxxx	16,739	xxx		301	70,435	xxx		1,309

Total number of companies included, 184.
During 1942, the companies included above represented 98.8% of the total output of finished rolled products.

* In accordance with Government policy, export figures cannot be published.

Complacency over Scrap Supplies Might Be Wiped Out by Several Factors

Pittsburgh

• • • **The opinion** in some quarters that the scrap situation is relatively easy is well supported by current statistics but possible future developments should take some of the complacency out of this viewpoint.

All inventories of ferrous scrap (as of the last of April) were close to 70 per cent higher than they were in January, 1942. Furthermore, there has been a sustained increase in the production of scrap coming from railroads and manufacturing concerns, a grade commonly known as industrial scrap.

On the other hand, total consumption of scrap has fluctuated between two and eight per cent above January, 1942. Due to a drop in lend-lease shipments of ingots and semi-finished steel last October, there has, for the past several months, been a consistent increase in the stocks of so-called "home scrap" which is generated within the steel mills.

While there is a possibility that no national scrap shortage will develop this year, evidence is seen of possible tight spots, geographically. At this early date such possible factors come under the classification of important "ifs".

Due to the seriousness and the importance of the next phase of the war neither steel producers nor scrap suppliers would care to be in the position of taking too conservative a viewpoint on the entire scrap situation. Even though current conditions indicate a rather "easy" (that is, easy from the standpoint of conditions early in 1942) scrap condition, considerable thought is being directed on the seriousness of the pig iron outlook engendered by an expected coal and coke shortage.

Present inventories of all ferrous scrap indicate a fairly good position when related to current consumption. While these inventories have been built up ostensibly to take care of emergencies, there is reason to believe that some of these emergencies are not far distant.

It has already been learned that scrap consumption has recently picked up and pig iron consumption has declined slightly in the manufacture of steel. One major reason for this trend has been the increased number of blast furnaces down for repairs which has necessitated a greater reliance upon scrap supplies. Late last week one result of the coal strike had been to focus attention on the greater use of scrap due to a current lack of sufficient coal for coke in blast furnace operation.

With increased steel capacity to be brought into operation the latter part of this year and early next year the demand for scrap will probably be at a greater rate than is now the case. This will be due to two reasons—one of which is of immediate concern, and the second is one which will begin to operate probably later this year.

The first factor involves a more recent lag in the completion of new blast furnace units which will probably not begin operations on the schedule set up a few months ago. Delays have occurred which have pushed back some of these units as much as 30 or 60 days. The second factor, which is far more serious, is the probability that before the end of this year sufficient coke will not be available to thoroughly utilize the blast furnace units capable of production. This condition existed before the coal strike which has only served to intensify this latest bottleneck.

Summing up the scrap situation, it can be said that: Current conditions are relatively easy, inventories are higher than they were a year ago, production scrap has not shown any important decline, and consumption seems to be well-balanced with supplies; however, the taking off of blast furnaces is already reflected in an in-

TABLE I

Trend in Ferrous Scrap—Inventories—Consumption—Production

Bureau of Mines Figures

Gross Tons—000 Omitted

Month	Total Inventories (End of Month)	Total Consumption	Railroad and Manufacturers' Scrap Production
1942			
January	4100	4425	531
February	4073	4204	514
March	4101	4661	600
April	4324	4603	616
May	4602	4665	626
June	4859	4464	641
July	5087	4470	644
August	5279	4478	696
September	5545	4424	758
October	6260	4770	832
November	6742	4401	755
December	6930	4497	765
1943			
January	6877	4492	775
February	6871	4178	806
March	6850	4787	959
April	6800*	4600*	950*

*Estimated.

NOTE: Inventories are on last day of month; Scrap production includes only from Railroads and Manufacturers; Inventories and Consumption include purchased and home scrap—April, 1943 estimated by The Iron Age.

• • • **The above trends indicate that scrap conditions today are relatively easy but they do not indicate that this condition can be changed rapidly by such things as coal strikes, delays in the pig iron expansion program, and insufficient coke for complete utilization of existing blast furnace units. The steel industry and the scrap industry have done a good job in building up scrap inventories and remaining scrap conscious. A let-down in this frame of mind might find both industries unprepared for emergencies which could arise later this year and early in 1944. Scrap consumption has already picked up because of less available steel-making pig iron and later this year the consumption line shown above will probably take an upward turn due to increased steel capacity and lagging blast furnace projects.**

crease in scrap consumption and a slight decrease in pig iron consumption, new blast furnace units which had been expected to supplement open-hearth requirements are still running behind schedule, the coal strike situation may cause some concerns to dip heavier into scrap inventories, and finally, the growing shortage of coke may prevent the full utilization of blast furnace units.

Around 50,000 Tons Of Clad Metal Scrap Piled over Nation

Pittsburgh

• • • **With the nation** short of copper, gilding clad metal scrap is piling up and now has reached a total accumulation of from 50,000 to 55,000 tons. About 20 per cent of the metal is gilding metal comprised of 90 per cent copper and 10 per cent zinc. The balance is steel.

So far only one firm, the Calumet & Hecla Co. at Calumet, Mich., is engaged in recovering the copper from the scrap. Their rate of recovery involves about 2500 tons of scrap a month. Provisions are being made to step this up by 7500 tons a month thus eventually making a total processing of 10,000 tons a month possible.

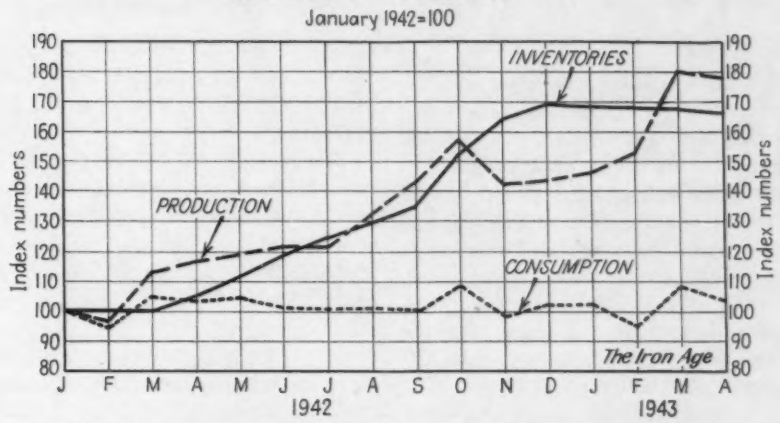
However, with the manufacture of bullet jackets which utilize the gilding clad metal resulting in approximately 20,000 tons of scrap a month and with vast piles already having been accumulated little progress is being made to recover the sorely needed copper.

A company here known as the Metal Chemical Corp. has been formed to recover the copper and has a new patented process. Efforts to get the Government to financially support the purchase of the necessary machinery and equipment have, so far, resulted in failure. It is said that government officials are not "sure" of the process working out even though chemists and officials of the company have already run test processing with reported success.

Meanwhile, with valuable gilding clad metal scrap accumulating at a rapid rate the WPB has issued orders tightening up the conservation of copper and urging close attention to recovery of regular copper scrap. Practically all of the gilding clad metal scrap is in sheet form and is the residual after disks have been punched from the metal. These disks are used to draw small caliber bullet jackets.

TRENDS IN FERROUS SCRAP-INVENTORIES-CONSUMPTION-PRODUCTION

SOURCE MATERIAL - BUREAU OF MINES
COMPILATIONS - THE IRON AGE



NOTES: Inventories are on last day of month; Scrap production includes only from Railroads and Manufactures; Inventories and Consumption include purchased and home scrap-April, 1943 estimated by The Iron Age

Ohio State Welding Library Established

Columbus, Ohio

• • • **A new library on welding,** believed the most extensive in existence and one which will be of inestimable value in welding development, particularly in the industrial field, has been established at the Ohio State University. Known as the A. F. Davis Welding Library, it is the gift of A. F. Davis, vice-president and secretary, Lincoln Electric Co., Cleveland. Mr. Davis received the degree of M. E. in electrical engineering from the university in 1914 and his reason for placing the library there was the fact that Ohio State has the only four-year course in welding engineering.

The library will be of special value to industrial designers, engineers, technicians and others interested in research or general information on the various forms of welding and their application to design, construction, manufacture or maintenance of metal products and structures.

Though in its early stage of development, the library already contains over 700 books. The library is located in the Industrial Engineering Building which houses the welding engineering department and is under the supervision of J. R. Stitt, associate professor, welding engineering.

HOWARD L. BEVIS (center), president of Ohio State University, who accepted the new welding library from A. F. Davis (left). The library will be under the supervision of J. R. Stitt (right) associate professor, welding engineering.

War Department Claims Only 30,000 Contracts Will Be Renegotiated

Cleveland

• • • **Any expectations** that the renegotiation of war contracts will bog down is doomed, Herbert Taylor, assistant to the chief of War Department Price Adjustment Board, stated Thursday in Cleveland. The original estimates of the number of companies that would have to be renegotiated, set at 85,000, is far in excess of actualities, he stated. A close estimate by the board disclosed that there are only about 30,000 such contracts that will come under the scrutiny of the Price Adjustment Board on renegotiation.

More than 2000 of these contracts have already been completed and some 7000 are now in process. By the end of 1943, it is estimated that 90 per cent of the renegotiation work will be done on the 1942 sales.

Of the 2000 contracts that have been renegotiated, about 30 per cent received complete clearances, indicating that there was no refund to the government of excess profits. The remaining 70 per cent of the contracts renegotiated resulted in a net cash return to the government of $955,000,000 and a price reduction on contracts now in effect valued at $1,584,000,000.

Without such renegotiation, some 70 per cent of this total of $2,539,000,000 would have been recovered through taxes, but this would have taken considerably longer, probably running well into 1945.

On the whole, Mr. Taylor stated, business is extremely cooperative in the renegotiation of war contracts. He stated that before the end of 1944, it is quite likely that legislation will be enacted to consider as a part of legitimate costs, a reserve for the reconversion of war plants back to peace-time production. However, at present the Price Adjustment Board has no authority to make such allowances to manufacturers.

As the Price Adjustment Board is manned in its entirety by business men, borrowed from industry, Mr. Taylor expressed confidence in the board's ability and desire to make fair and equitable adjustments on war contracts but not to allow excessive profits to any manufacturer. With every factor known taken into consideration in the renegotiation procedure, the board, through the various renegotiation committees throughout the country, is trying to make such adjustment as will be fair not only to the government, but also to the manufacturer.

Because of the many factors such as efficiency on contracts, quality of work done, capital invested, and development and research on contracts, a hard and fast formula for renegotiation is impossible. Consequently, every contract that comes up for renegotiation is a "kingdom unto itself" and has to be considered as something new to the board.

As to the procedure being made, Mr. Taylor stated that companies brought to the board's attention as making high profits are renegotiated first, then the larger corporations, third are those companies that request renegotiation, and then, of course, the remainder of companies working on war contracts. With almost 25 per cent of the 1942 war contracts already renegotiated, and the completion of renegotiation of 90 per cent of the contracts by the end of the year, Mr. Taylor expressed confidence in the board's ability to handle this job throughout the remainder of the war with efficiency and speed.

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Small Firms' Vital Role in War Shown by Chicago District Survey

Chicago

• • • **That** small manufacturers—firms with less than 500 employees—are playing a vital role in the production of ordnance materiel for America's armies is demonstrated by a report of the work of the Smaller War Plants division of the Chicago Ordnance District, issued last week.

The survey showed that during the period of Nov. 1 to May 20, 1687 manufacturers were contacted in the search for sub-contracting assistance. Of these 1472 or 87 per cent of the total, were companies employing less than 500 workers. The 215 larger companies were contacted only when all other efforts to place the business with smaller producers had failed. Of the small firms contacted, 522 received work, while 107 of the larger operators received contracts.

"The work of the Smaller War Plants unit is not confined strictly to ordnance procurement," H. P. Isham, chief of the purchase policy section of the Chicago Ordnance District, explained. "During the period covered by our survey, we learned of 419 needs for sub-contracting assistance. Of these requests for help, 214 came from ordnance prime contractors, 13 came from manufacturers of machine or expendable tools and 192 from contractors to other branches of the Army or other services."

During the same period, the perishable tool section of the Chicago Ordnance District also developed 150 small tool suppliers, Isham said. By helping these firms, he said, the delivery of standard and special small tools was expedited by an average of 20 weeks. In addition, $5,000,000 of new equipment was made available for other uses as this was not needed by tool builders.

"In other words," Isham pointed out, "the use of small facilities for the production of this equipment speeded up the delivery of these items by 20 weeks over delivery schedules promised by the large companies. In

A report on the distribution of contracts to plants in the Cleveland Ordnance District was published in THE IRON AGE, *June 3, 1943, p. 94.*

addition, by relieving the large firms of this load, it was possible for these companies to deliver their share of the business with reasonable promptness.

Isham pointed to the experience of one of the Chicago district's tank producers as an indication of the great value of small firms to the war effort and of the success with which the facilities of small plants are being utilized.

This tank producer turned to 865 suppliers and sub-contractors for help in creating the finished product. Seven hundred of these were in the so-called "small plant" group or employing less than 500 workers. A survey of this operation revealed that in one instance, one of the sub-contractors was, in turn, drawing upon 300 additional suppliers and contractors.

Of every dollar spent with the prime contractor in this case, 82 per cent was passed along to suppliers and sub-contractors, located in 206 cities in 25 states.

Here Are Additional Data on Steel Expansion Program

• • • Last week and the week before in the news section of this magazine, many tables and charts covering the steel expansion program were presented. The tables last week were obtained from the paper read before the general meeting of the American Iron and Steel Institute May 27 in New York by J. A. Kinney, assistant to vice-president, Bethlehem Steel Co. Below are additional data from Mr. Kinney's paper, presentation of which rounds out the subject. Increases in open hearth, blast furnace, electric furnace and by-product coke capacities, by companies, were included in the tables given last week. In the May 27 issue expansion by May 1 was published.

W.P.B. STEEL EXPANSION PROGRAM
ADDITIONAL ROLLING MILLS

Company	Location	Blooming Mills	Plate Mills	Structural Mills	Bar Mills
Copperweld Steel Co.	Warren, Ohio				24″—21″ Bar Mill
Granite City Steel Co.	Granite City		Revamp 90″ Plate Mill		
Jessop Steel Co.	Washington, Pa.				18″ Bar Mill
Kaiser Co., Henry J.	Fontana, Cal.	42″—2-high reversing 36″ Breakdown Mill	110″ Plate Mill—1-Roughing and Finishing Stand	28″ Structural Mill	18″—14″ Merchant Mill
Lukens Steel Co.	Coatesville		120″—4-high reversing as finisher for present 112″		
Oregon Electric Steel Rolling Mills					20″—12″—9″ Bar-Structural Mill
Republic Steel Corp.	Chicago	44″—2-high reversing 36″—Secondary bloomer			32″ Bar Mill
Sheffield Steel Corp.	Houston, Tex.	36″—2-high reversing	110″—3-high reversing		
United States Steel Corp. Carnegie-Illinois Steel Corp.	Homestead	44″—2-high reversing	160″—4-high reversing. Revamp 100″ plate mill		
Columbia Steel Co.	Geneva, Utah	44″—2-high reversing 28″—2-high reversing	132″ six stand 4-high continuous plate mill	24″ Structural Mill	

INCREASES IN ORE SINTERING CAPACITY (N.T. ANNUALLY)

Company	Location	Capacity
Alan Wood Steel Co.	Dover, N. J.	300,000
American Rolling Mill Co.	Hamilton	540,000
Bethlehem Steel Co.	Bethlehem	360,000
Colorado Fuel & Iron Corp.	Pueblo, Colo.	720,000
Columbia Steel Co.	Ironton, Utah	300,000
Columbia Steel Co.	Geneva, Utah	800,000
Inland Steel Co.	Indiana Harbor	432,000
Interlake Iron Corp.	Chicago	600,000
Interlake Iron Corp.	Toledo	600,000
Jones & Laughlin Steel Corp.	Pittsburgh	558,000
Jones & Laughlin Steel Corp.	Benson	1,120,000
Kaiser Co., Henry J.	Fontana	467,000
Pittsburgh Coke & Iron Co.	Neville Island	45,000
Republic Steel Corp.	Spaulding, Ala.	350,000
Republic Steel Corp.	Port Henry	765,000
Republic Steel Corp.	Cleveland	360,000
Republic Steel Corp.	Warren	382,000
Republic Steel Corp.	Youngstown	392,000
Republic Steel Corp.	Chicago	300,000
Wheeling Steel Corp.	Steubenville	360,000
Youngstown Sheet & Tube Co.	Campbell	720,000
Youngstown Sheet & Tube Co.	S. Chicago	300,000
Total increase in W.P.B. program		10,771,000
Capacity in effect Jan. 1, 1942		16,371,000
Capacity in effect at end of program		27,142,000
Increase over Jan. 1, 1942 in per cent		66

ANNUAL CAPACITIES—NET TONS

	1-1-1942	End of Program	Addition 1-1-42 to end of Program	Additions 1940 and 1941
Pig Iron & Ferro Alloys	60,394,000	71,287,000	10,893,000	4,670,000
Steel—Open Hearth	78,107,000	84,788,000	6,681,000	4,385,000
Steel—Bessemer	6,721,000	*6,553,000	D 168,000	711,000
Steel—Electric	3,741,000	6,315,000	2,574,000	1,853,000
Steel—Total	88,569,000	97,656,000	9,087,000	6,949,000

* 6,553,000 tons Bessemer capacity reported by I. & S. I. as of Jan. 1, 1943.
D—Decrease

ORE SHIPPING CAPACITY

The annual requirement of Lake ore at the end of the expansion program is estimated at 109,101,000 net tons, of which 3,751,000 net tons will go to Canada and 105,350,000 net tons to the U. S. A. Shipping capacity at the end of the program will be:

	Net Tons
Total by Water	107,299,360
Total by Rail	2,460,640
Total Shipping Capacity	109,760,000
By water to Canada	3,751,000
Total to U. S. A.	106,009,000

Detailed Procedure Given by WPB For Component Scheduling Plan Operation

Washington

• • • **Originally called** the Component Scheduling Plan, the system for flowing components was issued last week by WPB under the name Component Scheduling Procedure. (See THE IRON AGE, May 6, page 154.) The scheme would establish requirements and demand, and through the use of Form PD-903 enable WPB to schedule the order boards for the most critical of components.

The new procedures apply only to new orders, but it is expected they will be extended rapidly to all areas of components manufacture where insufficient output is holding back the production of end products.

General Scheduling Order M-293 comes into the picture, since all of the components falling within the scope of CSP are also covered by M-293 which gives the authority to freeze delivery schedules so that priorities, directives, and other procedures cannot disturb them. Manufacturers who participate in CSP may use the PD-903 form it provides in lieu of the form specified in M-293.

The procedure is limited to a selected group of Claimant Agencies, programs, control components, and subcomponents. This by no means limits the use of the mechanism to these specific industrial areas, and it is planned to incorporate this procedure into other programs which warrant the same type of treatment.

Scope

The Component Scheduling procedures—at first they will encompass only those Claimant Agencies responsible for programs or projects requiring the control components and sub-components listed below for new orders only:

1. **Claimant Agencies:** War Department, Navy Department, Maritime Commission, Aircraft Resources Control Office, Office of Rubber Director, Office of Lend-Lease Administration, Board of Economic Warfare, Petroleum Administration for War, Office of War Utilities WPB, Canadian Division WPB.
2. **Programs or projects:** ships, all sizes and types; tanks, combat vehicles and motor transport vehicles, as programmed by the War Department; power generating plants, both public and private, as programmed by the Office of War Utilities; and plants designed for the production of rubber, high octane gasoline, aluminum, magnesium, and steel.
3. **Control Components:** any of the following components when purchased directly from the manufacturer by the prime contractor or claimant agency building the project or the programmed product into which the components will go: turbines and turbo generators, motor generator sets, internal combustion engines, boilers, compressors and dry vacuum pumps, turbo blowers and exhaustors, steam condensers, heat exchangers, pressure vessels, fans and blowers, switch gear, pumps, stokers, pulverizers, transformers.
4. **Sub-components:** any of the following components, irrespective of who purchases them: crankshafts, fuel injectors, carburetors, magnetos, reduction gears, electric motors, electric motor controls, and generators; or any of the components listed in 3 above when purchased by a person other than the prime contractor or claimant agency.

Procedure, Control Components

The Claimant Agencies responsible for the programs or projects requiring control components, as included in the components scheduling procedure, also are responsible for presenting to the appropriate WPB Industry Division a Form PD-903 covering all orders for control components placed after June 1, 1943.

The Claimant Agency is required to determine whether it, the prime contractor, or the control component manufacturer, has the necessary technical information available for filling out the form, but in any event, the final responsibility for placing complete information on the form rests with the Claimant Agency.

A given Form PD-903 may contain no more than one class of control component to be ordered from one manufacturer, but several control components of a given class to be produced by a given manufacturer for use in several programs for which one Claimant Agency is responsible may be placed on one Form PD-903.

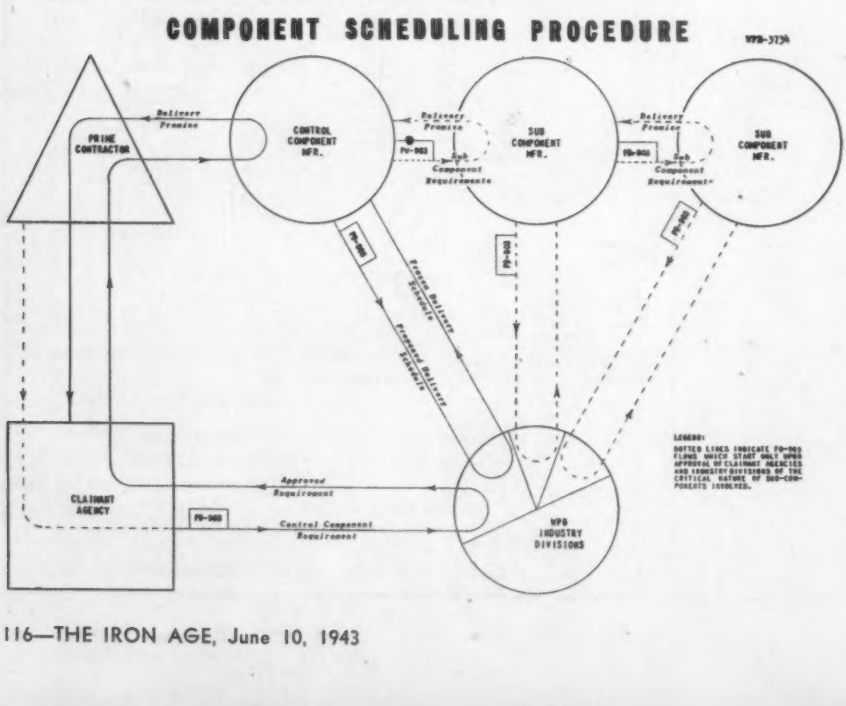
Claimant Agencies and their prime contractors are expected to program for several months into the future, indicating their requirements for control components to the full extent of the future program. The form makes provision for a 24-month program. It will be possible in only a limited number of instances for manufacturers and Claimant Agencies to program for the full 24 months. However, it is expected that on all programs and projects the future requirements will be indicated to the fullest extent possible.

Prime contractors may place orders for control components upon manufacturers prior to the filing of a Form PD-903, but in so doing must state on the order that it is subject to WPB approval. If a manufacturer starts work on an order for a control component prior to receiving WPB approval, it should be understood that he does so subject to its subsequent approval or disapproval under Order M-293 or other scheduling orders.

The Industry Division, upon receipt of a Form PD-903 from the Claimant Agency, will compare the required delivery schedule with the manufacturer's existing schedule of deliveries and make whatever adjustment is appropriate.

In any event, the Industry Division tentatively approves the Form PD-903 to its prime contractor who in turn presents it to the manufacturer of the control component. Control component manufacturers who receive tentatively approved Forms PD-903 indicate their promised delivery schedule against the required delivery schedule which has been presented to them. If, in order to produce the control component, one or more sub-components must be purchased from other manufacturers, the promised delivery schedules of these manufacturers will be obtained before the control component manufacturers indicate

THIS IS HOW the PD-903's flow between Claimant Agencies, prime contractors, control component manufacturers, sub-component manufacturers and the WPB industry divisions.



their promised delivery schedules for the control components.

If so instructed by a prime contractor, the manufacturer of a control component returns a copy of the PD-903 form on which he has indicated his promised delivery schedule to the prime contractor, who forwards it to the Claimant Agency unless instructed otherwise.

Procedure, Sub-Components

Every person, whether he is a prime contractor, sub-contractor, or sub-sub-contractor, who places an order for sub-components to be used in any of the programs or projects covered by the component scheduling procedure, presents the manufacturer of his required sub-components with a PD-903 form, only if he is instructed to do so by the person from whom he receives the form. The form identifies the program into which the sub-component goes and establishes a schedule of delivery requirements in harmony with the manufacturing schedule of the program.

Instructions as to application of the scheduling procedure to sub-components will be sent to manufacturers in the instructions for filing Form PD-903. Those sub-components to which the procedure should be applied will be listed in the instructions (List A) and will vary from production program to production program.

Items in List A of the instructions will have been determined to be sufficiently critical to require application of the scheduling procedure. Manufacturers will be asked to send Form PD-903 to their suppliers only when experience indicates that the sub-components involved are bottleneck items which justify such detailed scheduling. If no sub-components appear in List A of the PD-903 Instructions, manufacturers will not be asked to apply the PD-903 scheduling procedure to their suppliers for the particular program involved.

If the sub-component is ordered by a manufacturer of a control component, the Form PD-903 which the control component manufacturer received from the Claimant Agency and which was tentatively approved by the Industry Division forms the basis of filling out the Form PD-903 to be sent to the manufacturer of the sub-component when sub-component scheduling is included. If a manufacturer of a sub-component, in order to fulfill his contract, purchases another sub-component to which the procedure is applicable, the Form PD-903 which was presented to him by the control component manufacturer serves as the basis for filling out the Form PD-903 which he sends to the manufacturer from whom he intends to purchase the sub-component.

In the event a manufacturer in the contracting chain is unable to promise delivery corresponding to the required delivery schedule presented to him, his customer (the person whose delivery requirements cannot be met) will immediately report the situation to his WPB Industry Division, so that appropriate action may be taken.

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Questions and Answers Clarify Component Scheduling under GSO M-293

• • • **General Scheduling** Order M-293, issued on Feb. 26, has been the subject of numerous inquiries directed to the WPB. To clarify the operation of this order, answers to the questions most frequently asked in connection with the administration of the order are presented here.

• When no form number appears in the appendix opposite a given component, is it assumed that no schedule is to be filed by manufacturers of said component until the order has been amended to show a form number in the appropriate column?

• *Yes. However, the WPB may by special direction under subparagraph (e) of Order M-293 direct all or part of an industry to file a report.*

• When the manufacturer of a Class X component files his proposed delivery schedule, may he at once proceed to make deliveries in accordance with this schedule until advised to the contrary?

• *Yes.*

• In the event that a manufacturer of Class X components is unable to live up to his delivery schedule as filed because of unexpected delays, should he report this situation at once to his industry division or wait until he is again requested to file a new proposed schedule?

• *He should report the situation as promptly as practical.*

• In the event that a manufacturer of Class X component can build out of inventory a component which will not interfere with the delivery schedule which he filed, may he do so without first notifying his industry division?

• *No. He must report the matter to his industry division and make no deliveries which differ from his schedule as filed until so authorized by the War Production Board.*

• In the event that a company operates a number of plants producing the same Class X component, should it file a separate report for each plant or is one consolidated report sufficient?

• *If the facilities of the various plants are interchangeable and the component produced in each is the same, one consolidated report is sufficient.*

• When a manufacturer reports his production capacity as called for in Order M-293 in terms of units such as internal combustion engines, should he take into consideration the demand placed upon him for the production of spares and replacement parts?

• *Yes.*

• For what length of time does the proposed delivery schedule submitted by a Class X component manufacturer stay in effect or remain frozen?

• *For the period specified in the instructions with the schedule form.*

• Should a manufacturer of Class X components follow his usual practice in preparing his delivery schedule or are there additional factors which he must take into consideration in filing this schedule?

• *Manufacturers should arrange their schedule in accordance with the preference established by the applicable ratings, including directives as required by the Priorities Regulations except that when the War Production Board has directed an order of precedence under Order M-293, that order of precedence shall be followed by the manufacturer in making up his schedule until he is otherwise directed by the War Production Board.*

• In the event that WPB allocates orders placed with one manufacturer to another manufacturer, what will be the procedure for price adjustment if the latter manufacturer's price is higher than the former's?

• *This is a matter to be resolved between the manufacturer to whom the order is allotted and his customer.*

• In the event that a manufacturer of Class X components files his delivery schedule with the War Production Board and receives no further instructions, should he proceed to make deliveries on the basis of the schedule as filed?

• *Yes. He shall proceed on the basis of the request as filed.*

• Most manufacturers of Class X components purchase sub-assemblies from other manufacturers and such subassemblies become a part of the components to be delivered according to the schedule as filed. When such delivery schedule is approved, does this give the manufacturer the authority to pass it on as a frozen schedule to the plant from whom he will receive the sub-assembly?

• *No. The manufacturer in question should take all reasonable means to see that he receives his sub-assembly in time to comply with his delivery schedule as approved, but he is not authorized to place a frozen schedule on his subcontractor.*

• It is understood that a customer of a manufacturer of Class X components may not change the delivery of his orders from that stated on the approved delivery schedule unless the manufacturer is so instructed by the WPB. Does this mean that a purchaser may not change the shipping instruction or destination on his order?

• *No. A purchaser may change the destination on his order without first receiving the approval of the War Production Board.*

• May the industry division review

the proposed delivery schedule of a manufacturer of Class X components at the manufacturer's plant rather than force him to file a report in Washington?

• *No.*

• When the manufacturer of a critical common component subcontracts the building of a sub-assembly to another manufacturer, does the second manufacturer come within the terms of M-293?

• *Only in the event that the sub-assembly is in itself a critical common component as listed in the appendix to Order M-293.*

• In the event that a manufacturer of a Class X component produces certain standardized shelf items and certain other items which are custom built, may the industry division require him to report only the orders for the custom built items?

• *Yes, by so stating in the instructions which accompany the reporting form.*

• How can a manufacturer of a Class X component identify the end use of the components now that Priorities Regulation No. 10 is obsolete?

• *He can identify the end use to be made of the components by asking the person who ordered them from him to state the use which will be made of them.*

• In the event that a manufacturer of Class X components submits a proposed schedule of deliveries which extends for a year or more into the future, and it is impractical to freeze the entire delivery schedule, may the industry division freeze a portion of the schedule covering say a 90-day period?

• *Sub-paragraph (c) (2) of Order M-293 states that each manufacturer shall deliver Class X critical common components only in accordance with the schedule filed. If the industry division wishes to freeze only a part of the schedule as filed, it must notify the manufacturer to that effect by appropriate order. In the absence of such notice, the entire schedule becomes frozen.*

• Can manufacturers of components used entirely in their own end products be released from filing under Order M-293?

• *Only when specifically instructed by WPB.*

• In the event that a manufacturer of Class X components has filed a proposed schedule of deliveries for six months into the future which shows that his capacity is entirely utilized for the first three months but that he has substantial unsold capacity during the latter three months, may he accept orders for delivery during the latter three months without first receiving approval of the War Production Board?

• *Subparagraph (e) (2) of Order M-293 states that each manufacturer shall obtain Class X critical common components only in accordance with the schedule filed. It does not prevent a manufacturer from accepting additional orders provided that by so doing he does not interfere with his delivery schedules as filed. However, he may not make delivery of such orders until he has filed a proposed delivery schedule covering them with the War Production Board.*

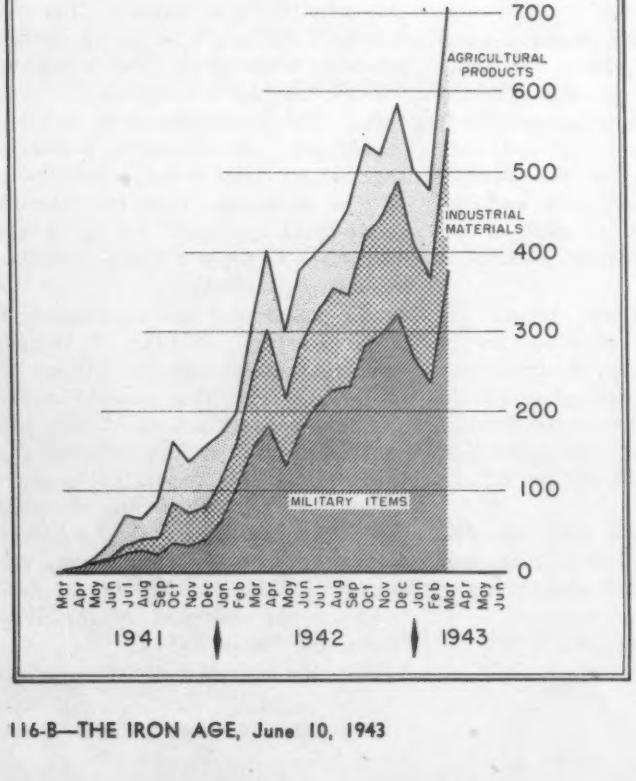
Court Action Filed Over South Buffalo Railway

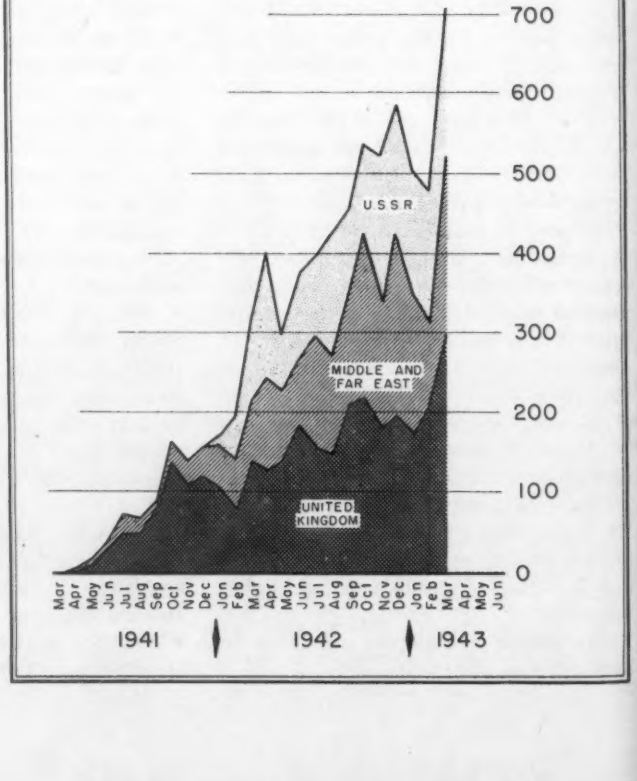
Buffalo

• • • **A government complaint** charging the South Buffalo Railway Co., the Bethlehem Steel Co. at Lackawanna and the Bethlehem Steel Corp. with violating the commodities clause of the interstate commerce act has been filed in federal district court for Western New York.

The action relates to the prohibition of shipments of commodities manufactured, mined or produced by a railroad or under its authority.

The complaint alleges the railway company and Bethlehem Steel Co. are owned, dominated and controlled by Bethlehem Steel Corp. and that the railway company for many years has transported vast quantities of articles and commodities other than those permitted by law.





"Bazooka" Sight Designed in Tunisia Rushed Here, Made, Shipped in 20 Days

Cleveland

• • • **From the battlefront** in Africa through a score of industrial plants in the Cleveland-Toledo area, and back to Africa within 20 days is a record hung up on the manufacture of new elevation sights for the "bazooka." The story told by Col. H. M. Reedall, Cleveland Ordnance District chief, was that an enterprising American soldier in the Tunisian campaign attracted attention by his accurate firing of the "Bazooka" and the grenade launcher. It was learned that the accuracy was due to new elevation sights that the soldier had devised and made.

The original sights were rushed back to United States by air to be turned out in quantity, the job being assigned to Cleveland Ordnance. From these samples, engineers of the Prestole Division of Detroit Harvester Co., Toledo and Boehm Pressed Steel Co., Cleveland, were given the job of setting up a manufacturing program. Instead of the normal two months manufacturing time, there had to be several thousand produced within two weeks. Prestole found five sub-contractors to make the needed dies and handle stamping and assembly. Five Detroit firms took on the brazing and Parkerizing, designing and supplying special shipping packages and supply parts. Three Cleveland companies and Boehm Pressed Steel Co. made part of the dies and another Cleveland outfit supplied screw machine parts.

Within six days the detail drawings were completed. Each sight required 16 different parts, some of which were difficult to make. A few days before the end of the two week deadline, materials and parts for both the "Bazooka" and grenade launcher sights were on hand and two intensive assembly programs started—one at Cleveland and the other at a stamping plant in Northville, Mich. Starting assembly on a Friday evening, with the deadline set for Sunday, these two companies worked straight through until shortly before midnight Saturday when the job was finished. Every source of available help including two presidents, three vice-presidents, a sales manager and a purchasing agent from companies participating in the work was used. At each assembly plant the job was completed with time to spare. The sights were assembled, rigidly inspected, and packed ready for shipping. A strongbox company, working with only a week's notice had turned out specially built containers that were leak proof, corrosion proof, and rattle proof. Within 14 days after the start of the work, both lots were shipped and within a few hours some were on their way to the battle zone by air.

"In this case," Col. Reedal said, "you have a clear cut demonstration of large companies and small companies, shop employees and management, engineers and school teachers—all teaming up to lick a job that couldn't be done. Quality was perfect.

Canadian Iron and Steel Production Down

Toronto

• • • **Production** of iron and steel in Canada continues to show a loss from the high records made last year. Furnace repairs have been the principal cause for the decline, while labor troubles at Sault Ste. Marie, Ont., and Sydney, N. S., cut sharply into January output. Officials of various companies, however, state that 1943 total production will exceed that of last year, as substantial new installations are nearing completion.

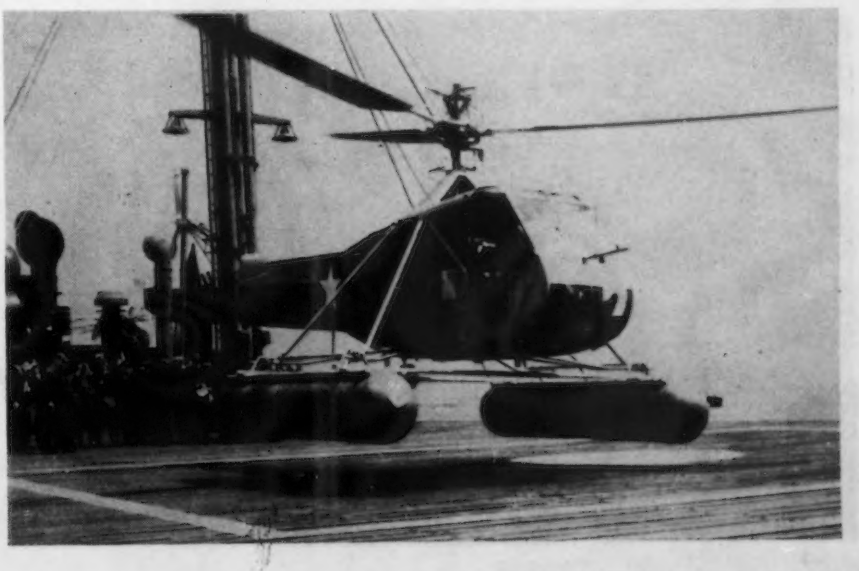
During April pig iron production amounted to 150,486 net tons, which compares with 160,101 tons in the previous month and 160,408 in April, 1942. Output during the month under review included 126,877 tons of basic iron, 10,170 tons of foundry iron, and 13,439 tons of malleable iron.

For the four months ending April 30 pig iron production totaled 565,154 tons, a decline of 12.3 per cent from the corresponding period of 1942. Production of ferro-alloys in April amounted to 17,094 net tons compared with 18,611 tons in March and 18,128 tons in April, 1942. For the first four months this year cumulative production of ferro-alloys totaled 69,493 net tons against 73,751 tons in the 1942 period.

Output of steel ingots and castings in April amounted to 264,357 net tons, compared with 270,962 tons in March, and 264,988 tons in April, 1942. This included 251,460 tons of steel ingots and 12,807 tons of castings. For the four months ending April 30 cumulative ingot and castings output totaled 987,915 tons, a decline of 10.5 per cent from the same period last year.

NEW SUBMARINE PROTECTION: This strange aircraft hovering over the deck of a Maritime Commission tanker is the Army Air Forces R-4 helicopter. Plans are being made by the War Shipping Administration for the addition of helicopters to Liberty ships as an added protection against submarines.

British-Combine



Cited for Awards

• • • Below are listed companies recently awarded the Army-Navy "E" for excellence in war production.

Climax Engineering Co., Clinton, Iowa.

•

E. I. du Pont de Nemours & Co., Belin Works, Moosic, Pa.

•

Foster Wheeler Corp., Carteret plant, Carteret, N. J. (fifth star).

•

Jones & Laughlin Steel Corp., Pittsburgh Works, Pittsburgh.

•

Republic Drill & Tool Co., Chicago.

•

Driver-Harris Co., Harrison, N. J.

Rockford Drilling Machine Division, Borg-Warner Corp., Chicago.

•

Ampco Metal, Inc., Milwaukee.

•

Universal Engineering Corp., Cedar Rapids, Iowa.

•

American Locomotive Co., Latrobe plant, Latrobe, Pa.

DESTROYER ESCORT POWER PLANT: Scale model of a new turbine-electric propulsion unit for destroyer escorts is inspected by Secretary of Navy Frank Knox (second from left) and Charles E. Wilson (right), WPB executive vice-chairman. General Electric officials Gerard Swope, W. E. Saupe and H. A. Winne point out details.

BOMBS FOR THE ALLIES: An armor-piercing bomb comes off the press at a plant of Bethlehem Steel Co., while the making of another one goes on. One bomb of this size is capable of sinking a heavy cruiser or battleship.

Alloy Steel Products Co., Inc., Linden, N. J.

•

Stewart-Warner Corp., Chicago (second star).

•

Alvey-Ferguson Co., Cincinnati.

•

Universal Engineering Corp., Cedar Rapids, Iowa.

•

American Cyanamid Co., Warren Plant, Linden, N. J.

•

American Potash & Chemical Corp., Trona, Calif.

•

American Well & Prospecting Co., Corsicana, Tex.

•

Atmospheric Nitrogen Corp., River Ordnance Works, Henderson, Ky.

•

Berry Brothers, Detroit.

•

Callaway Mills, Hillside Plant, La Grande, Ga.

•

Chambersburg Engineering Co., Chambersburg, Pa.

•

Cincinnati Ball Crank Co., Cincinnati.

•

Deere & Co., Moline, Ill.

•

Delta Finishing Co., Philadelphia.

•

Delta Oil Products Co., Milwaukee.

•

Dunn Woolen Co., Martinsburg, W. Va.

•

Eastern Tool & Mfg. Co., Bloomfield, N. J.

•

Fort Pitt Bedding Co., Pittsburgh.

•

Lebanon Steel Foundry, Lebanon, Pa.

•

Lufkin Foundry & Machine Co., Lufkin, Tex.

•

Magnetic Pigment Co., Trenton, N. J.

•

McKiernan-Terry Corp., Dover, N. J.

•

National Malleable & Steel Castings Co., Indianapolis.

•

Niagara Alkali Co., Niagara Falls, N. Y.

•

Nickey Bros., Inc., Memphis.

•

Nunnally McCrea Co., Inc., Atlanta.

•

Pelton & Crane Co., Detroit.

•

Pittsburgh Lectromelt Furnace Corp., Pittsburgh.

•

Pittsburgh Metallurgical Co., Inc., Niagara Division, Niagara Falls, N. Y.

•

Quality Tool & Die Co., Indianapolis.

•

Radio Speakers, Inc., Chicago Plant, Chicago.

•

Scanlan-Morris Co., Madison, Wis.

•

West Point Mfg. Co., Dixie Cotton Mills, La Grange, Ga.

•

Western Machine Tool Works, Holland, Mich.

•

Westington Electric & Mfg. Co., Mansfield Plant, Mansfield, O.

•

Worcester Pressed Steel Co., Worcester, Mass.

•

Zimmerman Steel Casting Co., Bettendorf, Iowa.

•

Maritime Commission "M"

Wilson-Snyder Mfg. Division, Oil Well Supply Co., subsidiary U. S. Steel Corp., Pittsburgh (gold star).

•

Maine Steel, Inc., South Portland, Me.

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More and more today... engineers and shop men are finding new ways to simplify mechanical movements and improve efficiency... by using T-J Air and Hydraulic Cylinders! This assures getting the *utmost useful work done*... with *minimum* loss of pressure due to friction.

These Cylinders are skillfully designed to deliver maximum power movement in every stroke... dependably... with long life. The mounting surfaces are parallel with (or at right angles to) the bore of the cylinder. All surfaces are strictly inspected for squareness and smoothness. All mounting holes are drilled—not just cored. T-J Cylinders are available in many sizes and styles... write for latest catalogs. The Tomkins-Johnson Co., Jackson, Michigan.

FOR TOUGH JOBS... SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

Fluorspar Supplies Seem Little Better

Cleveland

• • • **Fluorspar** supplies, a steelmakers' problem for the past several months, continue to be rather tight, but suppliers feel that the situation is better than it was about three months ago. However, no substantial inventories exist at the mills and deliveries are slow.

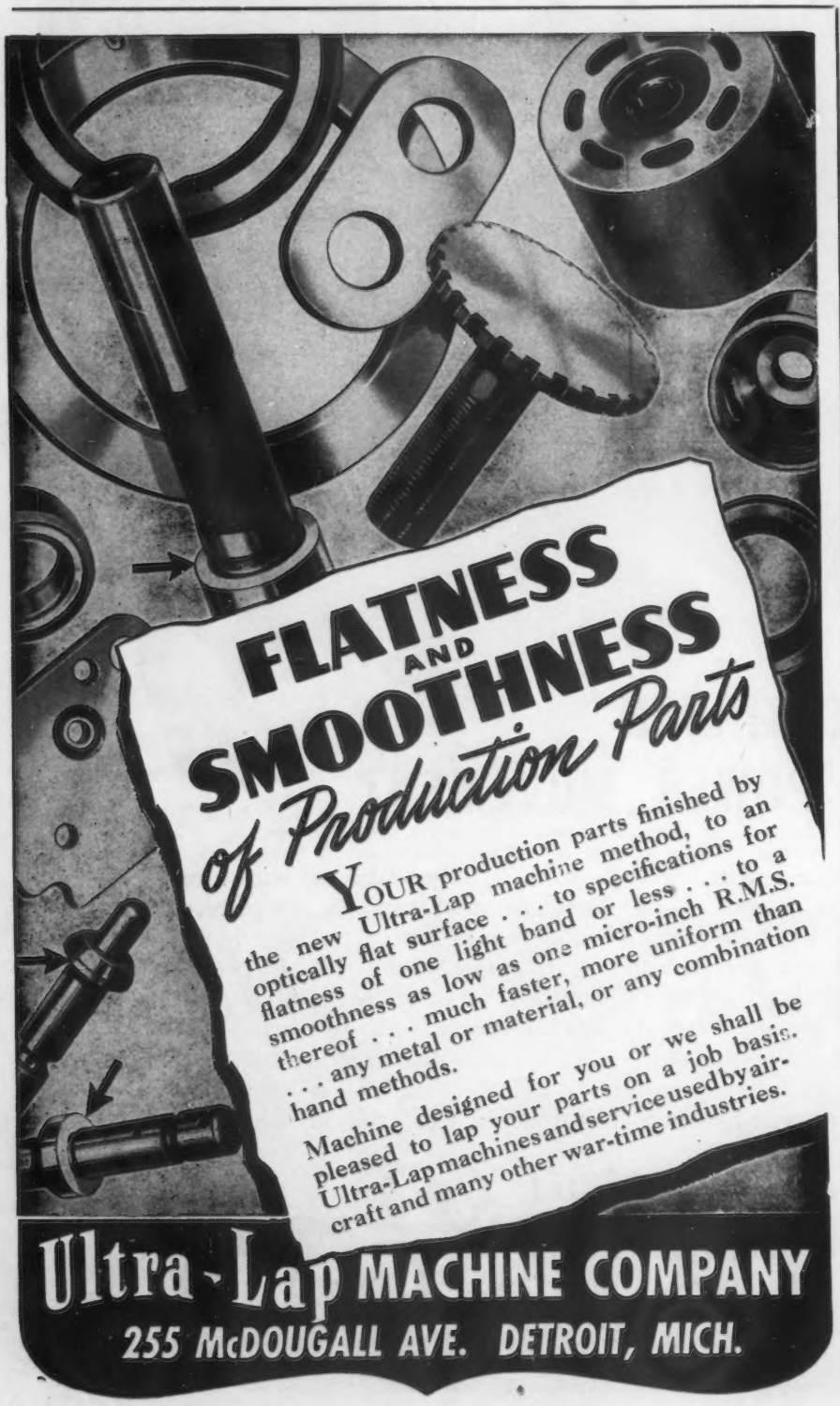
While there have been no plants forced to curtail operations as a result of not being able to obtain metallurgical spar, extensive conservation programs by steel producers plus the extensive use of such mixtures as mill scale with spar, have helped considerably. Concentrates of very high quality from Colorado also have come to the rescue. However, freight costs and the necessity for skillful handling of these concentrates, very difficult now in the face of the available unskilled help, present other problems.

The spar coming in from normal sources, it was reported by one producer, is of very inferior grade. While lower grades were agreed upon by producers and are supplied according to WPB regulations, users claim that shipments received recently are far below in quality the relaxed specifications of WPB.

Welding Wire Output Zooms

• • • The 1942 production of steel welding wire trebled that of 1940 and almost doubled that of 1941, thus reflecting the swift upsweep of this commodity in war times. Production in 1942 was approximately 800,400,000 lb. as compared with 453,120,000 lb. in 1941, according to the American Iron & Steel Institute.

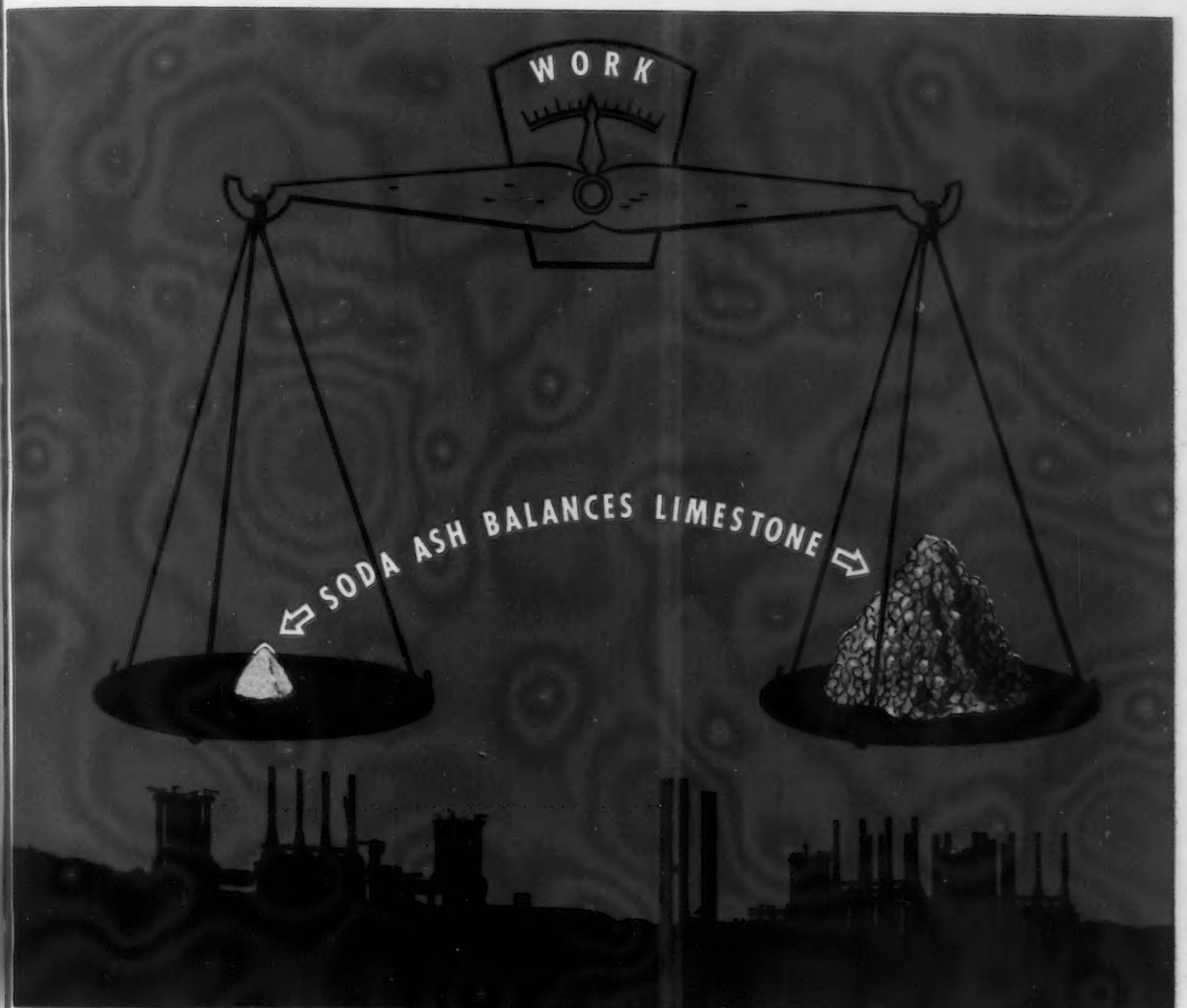
In 1938, before the war, for each ton of finished steel produced only 4.9 lb. of welding wire were made. This jumped to 5 lb. in 1940 under the war's influence and to 7 lb. in 1941. In 1942 the ratio jumped again to a high of 13 lb. for each ton of finished steel.


FLATNESS
AND
SMOOTHNESS
of Production Parts
YOUR production parts finished by the new Ultra-Lap machine method, to an optically flat surface . . . to specifications for flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S. thereof . . . much faster, more uniform than . . . any metal or material, or any combination hand methods.
Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.
Ultra-Lap MACHINE COMPANY
255 McDOUGALL AVE. DETROIT, MICH.

Renegotiation Discussed in Ordnance Association Report

• • • **"The Renegotiation of Contracts"** is the subject of Army Ordnance Report No. 1, dated May 20, published by the Army Ordnance Association, Mills Building, Washington. Although not an official government publication, it reflects the policy of the U. S. Army Ordnance Department as regards renegotiation of contracts under Section 403 of the 6th Supplemental National Defense Appropriation Act, as amended Oct. 21, 1942.

The report was prepared by Edward T. Gushee, vice-president of the Detroit Edison Co. and former principal purchasing consultant in the Office of the Chief of Ordnance. During his service in the Ordnance Department, Mr. Gushee was closely connected with the policies and plans looking to the renegotiation of armament contracts. The appendix of the report contains copies of several schedules and forms to be filled out. Copies may be obtained from the association at 5c. each.



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AND THE RESULT IS SULFUR CONTROL WITH INCREASED PRODUCTION

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BRIDGEPORT • CONNECTICUT

FEATURE CONTINUATIONS

Testing with X-ray Counting Tubes

(CONTINUED FROM PAGE 71)

For reliable industrial testing on a mass production basis, strongly radioactive substances must be used. The testing can then be made automatic. Thus, cylindrical castings of 9 in. diameter have been tested in production. A rate of testing of 27 sq. ft. an hr. had to be maintained and 1000 mg. of mesothorium were available. The radioactive material was placed inside the casting close to the wall and results were automatically recorded. Here the influence of measuring time or defect determination becomes important. For instance when a sheet of ½-in. thickness and 1½-in. width was placed on the outside, the registered defect appeared stronger than that occasioned by a spherical void of ¾ in. diameter in the interior of the casting, since the wider sheet lies in the path of the radiation for a long period of time. Spherical voids of 0.6 in. diameter could be determined at any depth. When, however, the testing speed was reduced to 5 sq. ft. an hr., voids of 0.3 in. diameter were still registered with a good deal of accuracy. In comparison it may be noted that 24 hr. of photographic gamma-ray testing will cover only about 11 sq. ft.

X-rays will increase testing speed where thicknesses of less than 4 in. of steel or 12 in. of light metal alloys are to be inspected. In an aluminum alloy block of 12 in. diameter, spherical voids of 0.4-in. diameter will be registered with great accuracy by X-ray radiation from a 250 kv tube, rate of testing being 15 min. per meter of casting length. Crack-shaped pipes which occasionally occur in these castings were also reported very promptly. Parts with an irregular wall thickness are best tested when two counting tubes are used side by side; they are wired in such a fashion that changes in the wall thickness of sound parts will balance each other. This differential setup is also advantageous in that it takes care of any electric current changes.

Improved Geiger-Mueller tubes can also reveal the micro-structure of materials through X-ray interference measurements. (Lindemann and Trost, Zs. Physik, 1940, p. 456), since the position and intensity of even weak interference lines can be measured rapidly with a high degree of accuracy. [*Translated by C. M. C.*]

THE NIGHT OF JANUARY 21st

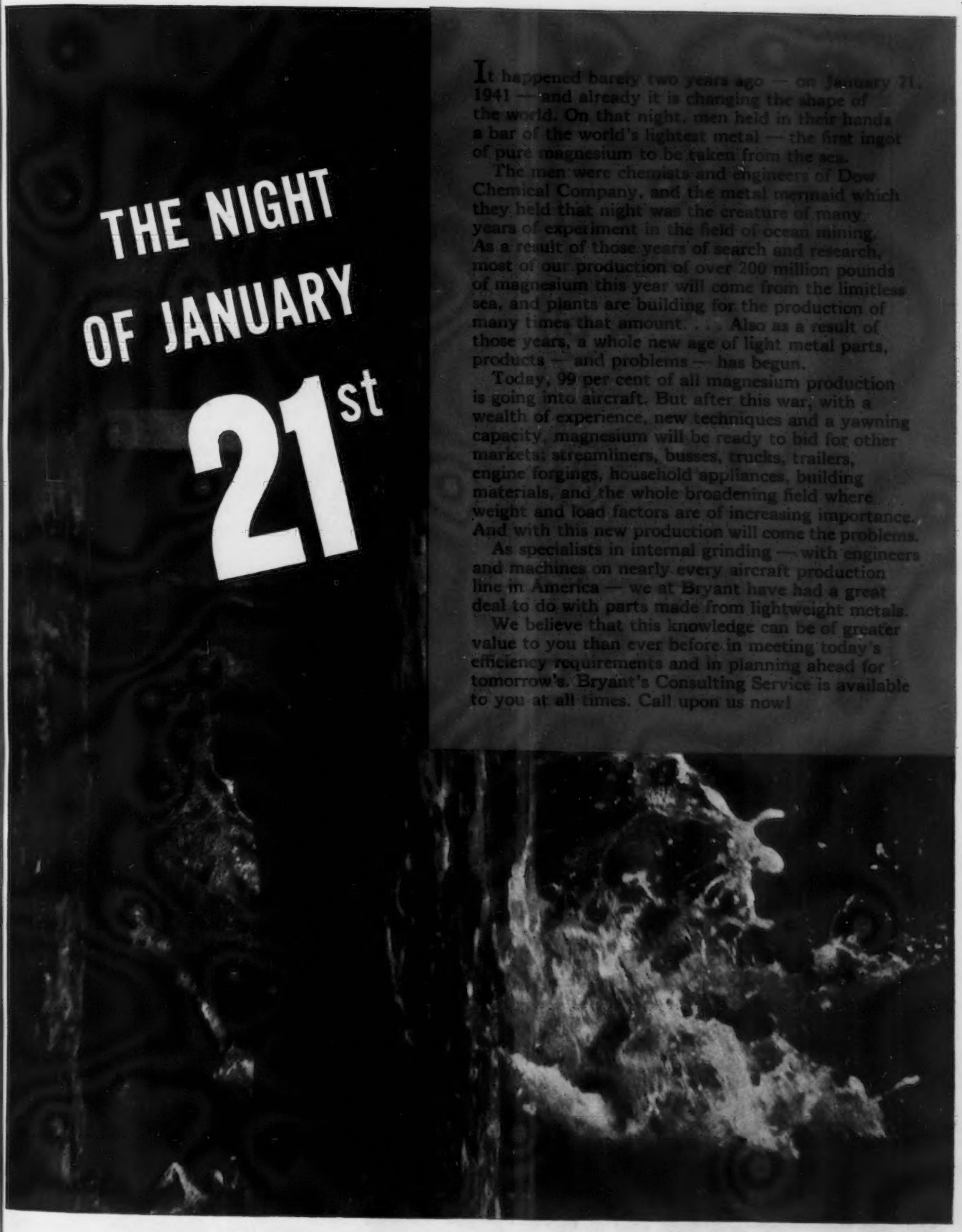
It happened barely two years ago — on January 21, 1941 — and already it is changing the shape of the world. On that night, men held in their hands a bar of the world's lightest metal — the first ingot of pure magnesium to be taken from the sea.

The men were chemists and engineers of Dow Chemical Company, and the metal mermaid which they held that night was the creature of many years of experiment in the field of ocean mining. As a result of those years of search and research, most of our production of over 200 million pounds of magnesium this year will come from the limitless sea, and plants are building for the production of many times that amount. . . . Also as a result of those years, a whole new age of light metal parts, products — and problems — has begun.

Today, 99 per cent of all magnesium production is going into aircraft. But after this war, with a wealth of experience, new techniques and a yawning capacity, magnesium will be ready to bid for other markets: streamliners, busses, trucks, trailers, engine forgings, household appliances, building materials, and the whole broadening field where weight and load factors are of increasing importance. And with this new production will come the problems.

As specialists in internal grinding — with engineers and machines on nearly every aircraft production line in America — we at Bryant have had a great deal to do with parts made from lightweight metals.

We believe that this knowledge can be of greater value to you than ever before in meeting today's efficiency requirements and in planning ahead for tomorrow's. Bryant's Consulting Service is available to you at all times. Call upon us now!



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In close-precision aircraft adjustments . . . *quick* accuracy is insured by Laminum shims. From factory assembly to vital field servicing! Laminum shims (easily peeled precision brass laminations) are cut to your specifications.

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FEATURE CONTINUATIONS

Steel and the Post-War World

(CONTINUED FROM PAGE 84)

pass through cities, and housing projects will pick up about the same time. It has been said that some 9 million new homes are needed today in this country. And some of these days, city after city will certainly have adequate slum clearance projects, particularly when it is realized that this sort of thing pays large dividends in better health and decreased juvenile and adult delinquency costs. Finally may come huge new power projects of the Boulder Dam and Grand Coulee type, with extensive rural electrification schemes to distribute blocks of the power to sections of the country where homes still do not have running water, central heating or adequate lighting facilities. In all these works, steel is indispensable.

In spite of the competition which other materials will increasingly offer, the use of steel should increase in the container industry, because the whole container industry is developing rapidly. In 1939 that industry absorbed about 3 million tons of steel. The growing need should absorb at least an increase of half a million tons. A large part of the foodstuffs shipped out of this country to feed other peoples will go in cans.

Household and institutional equipment is a category which covers the most rapidly developing field of steel consumption in this generation. It embraces most of the pressing, forming and stamping industry, and utilizes mostly light flat-rolled products. Refrigerators, stoves, heating and air-conditioning equipment, furniture, cabinets, office machines, kitchen utensils, cutlery, and electrical appliances of a thousand types are included. Pent-up demand will burst forth like the flood from a broken dam. The tonnage of steel involved is no real criterion of the market opportunities here.

Machinery and tools present a mixed picture. Many machine tools built for war purposes will be of no use later for civilian production, but many more special purpose tools will also be required and will keep the machine tool industry running at a fair rate of operations for many years. There will be heavy demands for earth-moving equipment and hand tools, as well as lesser demands for cranes, hoists, conveyors and all sorts of industrial electrical equipment for use as production tools in the industries reconverted to civilian pursuits.

Oil and natural gas presents a field in which, whether the use of these commodities as fuels, or as bases for synthetics such as rubber, plastics or chemicals is considered, the future is bound to be greater than the past. In many ways this ties into the mining of coal, especially from the by-product angle. The full possibilities of synthetic materials, the uses of which may be complementary to, rather than competitive with, steel, have not yet even been glimpsed.

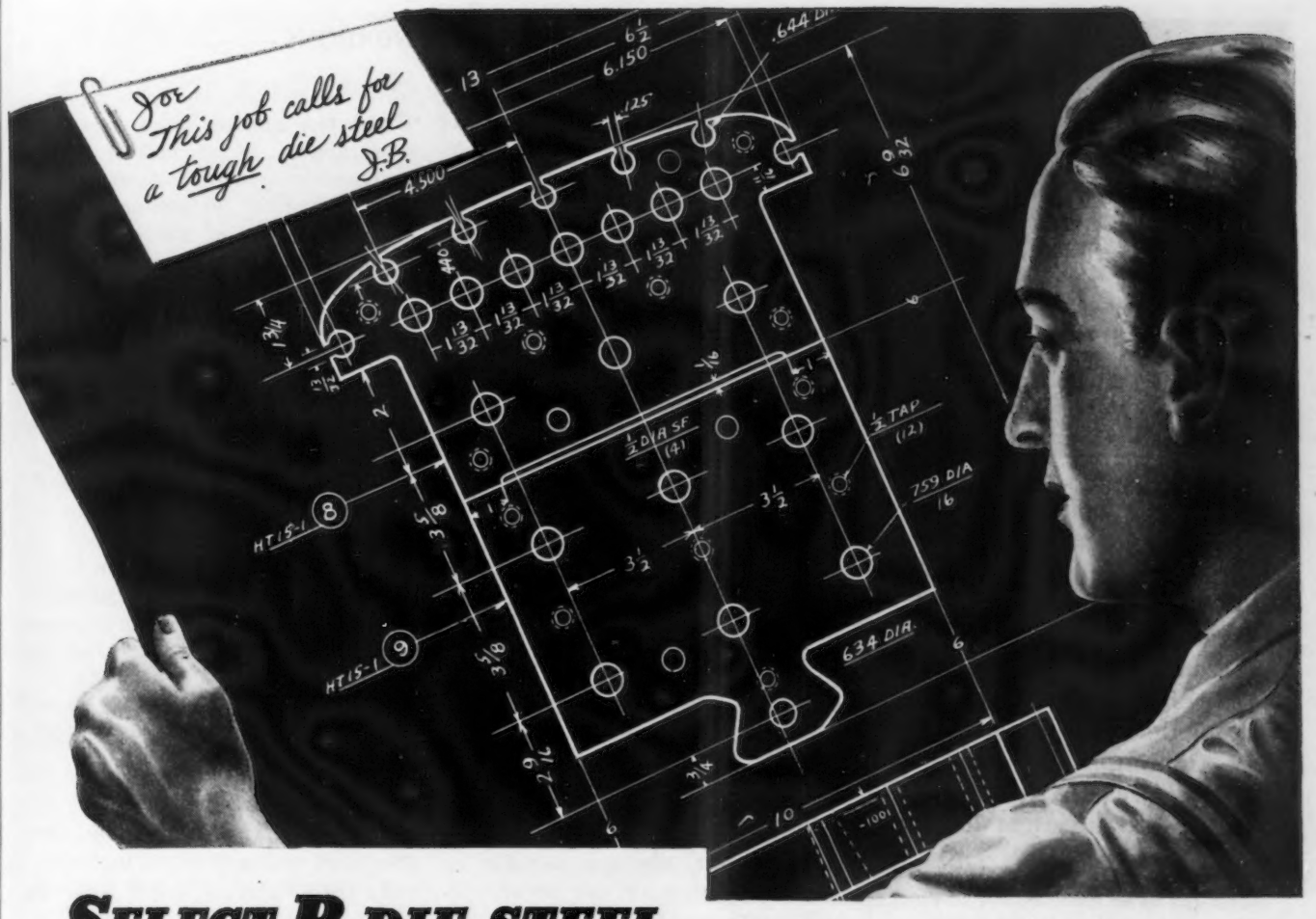
The railroads are and will remain the backbone of our transportation system, but they have been starved for years, and the replacement and maintenance problems after the war will be tremendous. Whatever consolidations may be effected, a counterbalancing influence will be found in the increased use of the high-speed diesel-electric locomotive, requiring perhaps the replacement of much line trackage, the easement of curves, and the building of thousands of lightweight freight and passenger cars, to say nothing of other operating equipment.

Shipbuilding will slump, of course; but passenger liners will be built, and oil tankers will be required. And if America is to do her share in policing the postwar world, additional naval construction will be needed. Many of the shipyards should continue to operate.

Jobbers will probably continue to grow in importance after the war, continuing the trend manifested over the past 20 years in servicing the small quantity user. Recently jobbers have taken between 15 and 16 per cent of the total steel output. Excluding export, the figure of 8½ million tons is slightly more than 21 per cent of the domestic consumption, or 17 per cent of the total.

And, finally, there is little doubt that considerable quantities of steel will be exported for several years to help rebuild torn countries and devastated industries all over the world—at least until their own production facilities are brought back to par.

In discussing these figures with many men in the steel industry and with other men in steel consuming industries, general agreement of opinion has been found as to the total figure of 50 million tons but a wide variance as to the details of the distribution of that total. Fortunately, however, in all the steel consuming industries men everywhere are figur-



SELECT B DIE STEEL
... for toughness

"My problem is simply this: I have to choose a die steel that is tough and yet withstands considerable abrasion." So said a perplexed die shop superintendent recently to our metallurgical service man. "And don't forget," he added, "it has to machine easily, must be non-deforming and can't be ground after hardening — so the die must be free from scale or decarburization after heat treatment."

"Well, here is the answer," said the Latrobe Metallurgical Service Man. "It's *Select B* . . . a tough die steel that won't deform and will withstand abrasion. As far as heat treating, that is easy: Pack the die in sifted grey cast iron chips, dry charcoal or spent carburizing compound. Cast iron chips will prove preferable, since they won't build up carbon and cause brittleness of cutting edges.

"Since the dies are of a rather intricate nature, preheat at about 1400°F. As soon as they have become heated to this temperature bring furnace up to 1750–1775°F. Hold for just sufficient time for the container to become thoroughly heated, then remove the part and air cool in still air.

"When you can just about pick the dies up with your bare hand draw them at 900°F. The thickness being about 2½", hold for about four hours at this temperature. This will give a hardness of about Rockwell C-58 with the necessary toughness."

The result: This Company greatly simplified their die machinery problems, the production was increased and a substantial saving in their die steel costs was secured. It's a simple illustration of the timely help you can get to meet today's vital production problems with Latrobe Metallurgical Service. It's a technical help you can feel free to use. A special bulletin on "Select B" is available.

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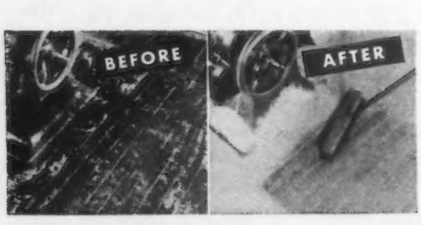
If you're carelessly "painting" the floor of your plant with inflammable, slippery oil, you need Speedi-Dri. Take a walk through the shop. Notice the condition of the floor around the machines. Can you *possibly* overlook the danger of your employes slipping in that oily mess? *Think* what a carelessly dropped match or cigarette might do!

Speedi-Dri soaks up grease and oil like a sponge, sets up an immediate skid-proof surface and blankets the hazard of flash fires. So great is its affinity for oils that, in time, it will pull old deposits right out of the floor, restoring the original appearance. Speedi-Dri saves workmen's shoes from oil-rot, minimizing the danger of foot infections. Easily and quickly spread by hand, it conserves vital manpower. No matter what you are now using, Speedi-Dri can do the job better, faster, cheaper. Prove it by testing Speedi-Dri in your own shop. (Where water is present or water soluble oils are used, ask for Sol-Speedi-Dri.) Prompt service from warehouse stocks in leading cities.



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WAVERLY PETROLEUM PRODUCTS CO.
Menlo Park, Calif.

ing their own problems along somewhat similar lines—that is, how to keep going at a rate of operation which will permit reasonably full employment. As they do this, it becomes increasingly apparent that steel is a basic part of the whole manufacturing picture. Therefore, what the steel industry does and plans to do is so closely linked with what they do and plan to do that it must all be taken together to get any clear view of the future. All around the vast circle each move is inextricably linked to every other move.

It all comes to this: Industry as a whole must move in unison in this matter of postwar planning, just like two people dancing together. And since the band that plays the tune for the dance is nothing more or less than old friends Mr. and Mrs. John Q. Public, who must themselves be employed and paid wages in order to play the tune, the whole thing gets back once more to a question of full employment.

So postwar planning becomes a matter of balancing out production everywhere so that each industry will order its own operations to take what must be considered its proper share of jobs to keep the whole country on a basis of full employment. Only thus can money be made to circulate at a rate which will permit people to buy the things and services that full employment produces. That balancing out implies the more careful study of what full employment really means, what production will result therefrom, and what demand is necessary to absorb that production in order to keep the full circle in movement—on the farms, on the railroads, in the factories and the mines, as well as in the service industries. Private enterprise is at last beginning to understand that this is a problem of cooperation which private enterprise itself must solve if the way of life in the future is to remain one of private enterprise at all. The only alternative is a state socialism partaking of all the faults of fascism and communism.

Balancing entails consideration of capacities. If an industry has a production capacity of 9 million units a year, and balanced operations for some years after the war indicate a production of 6 million units, it may come to be considered an economic waste to maintain the excess capacity. If the steel industry has a steel products capacity of 66 million tons a year, and balanced operations indicate a production of 50 million tons, at least some part of the excess may prove to be an undesirable burden, although in this case a good argument may be advanced that such excess capacity is insurance for just such a contingency as war. Today some part of the steel industry's capacity is obsolete or obsolescent. This provides a major opportunity of electing to continue only the most efficient units and of improving the rest up to the limits of a balanced production. It will pay to do this, for in the future no business will be able to afford to tolerate inefficient operation because that sort of thing will make full employment too costly.

All this seems to indicate that a tending toward a static level of production and demand, on the basis of the factors of industry balance after the war. That impression is not intended. The first, primary balancing operations are for the purpose of attaining full employment after demobilization, and of maintaining it for a period long enough to get a second wind. Then technological advances should work to lower costs and increase demand, new industries to develop and come into operation, providing new opportunities for investment and new opportunities for employment, so that the circulation of money will be further stimulated, making necessary the building of new production capacities. But when the need for such new production capacities arises, they should be built freshly as modern, up-to-date, efficient capacities. They will not be obsolete capacities which today are industry's excess capacities.

The real solution, it seems, lies in working together to attain something in the nature of a reasonable balance between desire and what it is possible to get. If enough industries study the problems of the industries upon which they depend, as well as their own immediate problems of producing and selling, in the endeavor to attain such a balance, it *will* be possible to achieve that objective which is the keystone of all postwar planning: to provide work so that money *will* circulate to provide work so that money *can* circulate.

FEATURE CONTINUATIONS

Improving Fatigue Strength Of Machine Parts

(CONTINUED FROM PAGE 69)

millions of gears before it was realized that gear teeth fail by fatigue and that fatigue failure, for the usual depth of carburization, always originates at the surface of the case. From this evidence it became clear the heat treatment should consider the requirements of the carburized case only, and that the properties of the core were relatively unimportant, because in bending and in torsion, the core serves mainly as a stuffing for the case.

Physical Tests

Several kinds of impact tests are still being used and impact specifications appear in many drawings but no man can explain and substantiate the significance of the test in terms of the service strength of machine parts.

Elongation and reduction of area are carefully measured and are prominent in our specifications, but their meaning in terms of serviceability of machine parts is not known. We are told that "brittleness" must be avoided but no matter how brittleness is defined it does not explain why this property is necessarily more harmful than ductility. Most machine parts that are plastically deformed are just as surely failed as if they were broken. It is believed that machine parts generally must possess relatively high ductility and they must therefore be heat treated to develop this property. However, when severe dynamic loads are applied, ductility is forgotten and high hardness that certainly is well within the range of "brittleness" is specified. Strong fatigue resistant gear teeth are file hard. Wrist pins, ball bearings, roller bearings, shafts and cams are hard and they are strong and fatigue resistant because they are hard.

A gear tooth is just as surely a spring as the coil that actuates a valve. Why, then, must the one be hard and "brittle" and the other be relatively soft and "ductile"? Why cannot stronger, hardened materials be used? The answer may lie in the concept of brittleness. "Brittleness" from the hardness when hardness is obtained by nitriding is not feared. Nitrided surfaces are not notch sensitive because they are stressed in compression.

Notch sensitivity is probably the inability of a non-ductile material to yield locally and thus reduce tension

Let LAMSON do the moving!

In the production of shell-cases, for instance, Lamson Conveyors are saving vital manpower all along the line. From raw material to finished product, through machining, heat-treating and inspection operations, Conveyors have eliminated wasted hours of unproductive handling. In one ordnance plant alone the rough forgings enter on Lamson V-Type Gravity Conveyors, are moved through 27 operations in the plant, and into the freight cars. When you realize that these cases weigh 140 lbs. in the rough and emerge completed still weighing 75, you know that they are too heavy, and go through too many operations to be moved by hand for fast production. But Lamson doesn't stop here — even on battlewagons our Intermediate Hoists and Conveyors pass these shells to their ultimate destination against the Japs!

Write for new Wartime Conveyor Bulletin 1A

Overhead and out of the way, this conveyor cools shell-cases for the next operation.
LAMSON CORPORATION
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Makers of Conveyors and Pneumatic Dispatch Tubes

THE INGERSOLL

THE INGERSOLL MILLING MACHINE CO.

CUTTER GRINDER

THE INGERSOLL CUTTER GRINDER is particularly designed for grinding Face Milling Cutters. It grinds at a single setting of the cutter the face, periphery, and corners of cutters from 4 inches to 30 inches in diameter and having a maximum peripheral face of 7 inches. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic. The technique for grinding milling cutters is simple and easily followed when thoroughly understood.

THE NEW MANUAL pictured below shows, through illustrations, the wide range of application of this machine and assists the operator in the best methods of grinding. A copy of this interesting book will be mailed to you upon request.

ROCKFORD, ILLINOIS

CONVENTIONAL FACE MILL

INGERSOLL SHEAR CLEAR

DOUBLE ANGULAR CUTTERS

stresses in local highly stressed regions, such as notches and scratches. The amount of ductility that is required to overcome "brittleness" depends upon the amount of yield that is necessary to reduce local tension stresses. If the surface is sufficiently pre-stressed in compression, local yielding is not required and therefore non-ductile materials will not be "brittle." As understanding of "brittleness" is improved the use of steels at higher hardness will be expanded.

Laboratory hardenability tests are now coming into general use. This test has much merit provided its meaning is understood and that arbitrary hardenability specifications are not applied without considering the requirements of each particular part. Through hardenability (approximately uniform hardness through the section), can be very important for parts that are stressed in tension but it is difficult to see why through hardness is necessary in parts that are loaded in bending or in torsion because in such members the stress decreases somewhat linearly with depth reaching zero at the neutral axis. For this kind of loading it would seem to be more important to develop heat treatments that give the type of internal stress shown in Fig. 15 because, being pre-stressed negatively to the applied tension load, the dynamic load carrying capacity is greatly increased.

The standard laboratory tensile test is, of course, incapable of indicating the useful bending or torsion strength of pre-stressed specimens, particularly when the pre-stressing is deep as shown in Fig. 6. For such specimens the tensile test cannot even distinguish between harmful and beneficial pre-stressing. Both would probably show decreased tensile strength whereas under dynamic bending or torsion loads one would show greatly decreased fatigue strength and the other greatly increased fatigue strength.

Fatigue data are mortality data and it is just as absurd to expect that reliable actuarial tables can be constructed from mortality data on a half dozen individuals as to expect that reliable comparisons can be made from fatigue tests on a half dozen machine parts. When a sufficient number of machine parts are fatigue tested at constant load and plotted in the manner of the well known mortality experience. Heindlhofer and Sjvall[10] have shown life expectancy curves for commercially identical ball bearings, for commercially identical mazda lamps and for human beings.

Another important difference is the relative life span for various machine parts. For automobile rear axle gears for example the life span of the most durable unit is about four times the life span of the poorest unit but for automobile transmission gears the life ratio from the best to the poorest was about 15:1.

The percentage variation in life of machine parts will also change as the test load or load range is changed. When tests are conducted at high load or high load range to produce fatigue failure after relatively few stress cycles, the percentage variation from the best to the poorest will be less than if the test is conducted at a lower load to produce fatigue failure after a relatively large number of stress cycles.

In the class of light machines where weight must be conserved, it will probably never be possible to design

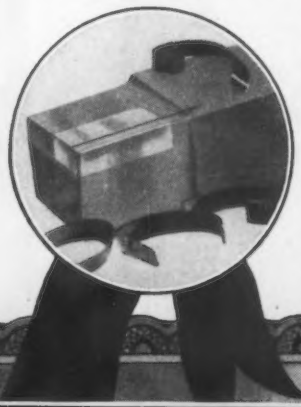
PRODUCTION INSURANCE

The installation of KENNAMETAL steel-cutting carbide tools for boring, turning, and facing operations will insure maximum steel machining production.

KENNAMETAL assures maximum production because:

1. KENNAMETAL operates at speeds equal to machine capacity.
2. KENNAMETAL cuts more steel per regrind and more steel per tool life.
3. KENNAMETAL cuts high Brinell steels at economical feeds and speeds.
4. KENNAMETAL takes jump cuts without danger of tool breakage.
5. KENNAMETAL holds size on long cuts.

Eliminate risk and insure your production . . . use KENNAMETAL steel-cutting carbide tools.



McKENNA METALS Co.
144 LLOYD AVE., LATROBE, PA.
Trade Mark Reg. U. S. Pat. Off.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

Murchey

#42 Thread Milling Machine

Delivery Four Weeks

When you require airplane accuracy in threading; when the thread diameters are large or the work unwieldy —remember the Murchey #42 Thread Milling Machine. It is the answer to these problems.

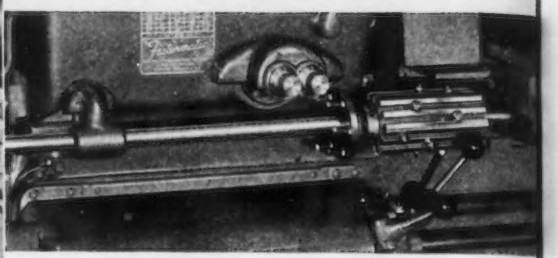
With assurance of extremely close tolerances and concentricity, this machine mills external and internal threads 4" to 12" dia. by 3" long using annular milling cutters covering full length of thread.

Murchey also manufactures the #32, a smaller machine for threads 1" to 4" diameter.

MURCHEY MACHINE & TOOL CO., DETROIT, MICH.

Murchey manufactures all types of Collapsible Taps, Self Opening Die Heads, Shell Tapping and Thread Milling Machines

4 SPEEDS...3 FEEDS... *Automatically Changed*



Fastermatic

Automatic Speed Control and Hydraulic Feed System Insure Maximum Operating Efficiency

This crankcase bearing retainer job is another example of how the automatic speed control and hydraulic feed system of Foster "Fastermatics" permits tooling arrangements for the most efficient operation as determined by the type of material being cut and the type of cutting tools used.

Four operations, including turning, boring, facing, and chamfering, are machined in 9 minutes floor-to-floor time on three Foster "Fastermatics." During these operations four speeds of 277 r.p.m., 94 r.p.m., 148 r.p.m., and 263 r.p.m., and three feeds of .015", .008" and 0.2", automatically controlled for each operation, are used.

Easy to Set Up and Operate

The entire machining cycle is automatic and operator has only to load and unload the work. In actual operation one operator can usually handle several machines. All controls and adjustments are simple and convenient and set-up changes can be made with very little effort.

Foster Engineers will be glad to check over your chucking machine problems and make their recommendations as to how "Fastermatics" can help you obtain greater accuracy, increased production and lower machining costs. There is no obligation.

Automatic Speed Control

To maintain the most efficient operating speeds at all times, speed changes are automatically made by hydraulically operated clutches, and may be made for each face of the turret at any time during the cut or forward rapid traverse. Standard buttons placed on the master spool shown above effect the changes and determine the proper time of making the change. Several speed changes may be made for each face of the turret.

Hydraulic Feed System

An infinite number of feeds are provided by a flexible hydraulic feed system, with the rate of feed desired automatically controlled for each operation by standard cams mounted on the cam drum shown above. A separate and independent feed for each face of the turret is provided. Any combination of feeding and rapid traverse movements may be incorporated into any operation.

Facts about this Job!

Machine—3 Foster 2F "Fastermatics."

Part—Crankcase Bearing Retainer.

Material—AMS6290

Holding Method . . .
1st Operation—Chuck on O.D. of flange.
2nd Operation—Chuck on O.D. on ring.
3rd Operation—Chuck inside diameter on ring.

Feeds . . .
1st Operation—.015".
2nd Operation—.015".
3rd Operation—.008"–.015".
4th Operation—.008"–0.2".
(automatically changed)

Speeds . . .
1st Operation—277 r.p.m.
2nd Operation—277 r.p.m.
3rd Operation—94 r.p.m.–277 r.p.m.
4th Operation—148 r.p.m.–263 r.p.m.
(automatically shifted at proper time)

Accuracy—Within .004" for rough, semi-finish and finishing operation.

Production—9 minutes floor-to-floor time.

FREE!

Production Men Get the Facts in New "Fastermatic" Catalog

Get the complete facts and details of these highly productive, Foster Automatic Turret Lathes in the new "Fastermatic" catalog. Write to Foster Division, 1108 Beardsley Avenue, Elkhart, Indiana, for your free copy.

INTERNATIONAL MACHINE TOOL CORPORATION

FOSTER DIVISION, ELKHART, INDIANA · LIBBY DIVISION, INDIANAPOLIS, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS · LIBBY HEAVY DUTY TURRET LATHES · STANDARD TOOLS
SUPERFINISHING MACHINES · BARKER CHUCKS · UNIVERSAL RAM TYPE TURRET LATHES

mechanisms to withstand all the abuses that are encountered in service. If an airplane engine, for example, should be so sturdily designed that the shortest lived of each of its numerous parts would be failure proof under all the abusive conditions that may be experienced in service, the engine would be so heavy as to be impractical.

In practical fatigue testing of machine parts, it should be obvious that comparisons of material, design or processes cannot be made unless the tests are run to failure and the comparisons are made on the number of stress cycles each will endure. This is true whether or not the part being tested is required to withstand, in service, a very large number of stress reversals at maximum load such as a crankshaft or a relatively small number of stress reversals at maximum load, such as chassis springs. Since all representative tests are made at loads that result in failure by fatigue, our interest lies not in the fatigue endurance limit where for steel, under most test conditions life is infinite, but in that portion of the fatigue curve to the left of the "knee" where life is infinite, that is, the sloping part of the curve.

Bibliography

[1] "Das Druken Der Oberflache Von Bauteilen Aus," Stahl und Eisen, O. Foeppl, Vol. 49, 1929, p. 575.

[2] A.S.M.E. Transactions, Vol. 58, 1936, PP.A-91, A-98, "Increasing the Fatigue Strength of Press-Fitted Axle Assemblies by Surface Rolling," by O. J. Horger and J. L. Maulbetsch.

[3] "Die Wirkong Von Eigenspannungen Auf Die Biegschwingungsfestigkeit," Von Hans Buhler und Herbert Bucholtz, Stahl und Eisen, Vol. 53, Dec. 1933, p. 1330.

[4] "Cold Rolling Raises Fatigue or Endurance Limit," S. G. Von Heydekampf, THE IRON AGE, Vol. 126, Sept. 18, 1930, p. 775, and "Axle Fatigue Inhibited by Truss Graining," F. F. Johnson and T. W. Lippert, THE IRON AGE, March 29, 1934.

[5] Journal of the Iron and Steel Inst., Vol. 66, No. 11, 1927. "The Work-Hardening of Steel by Abrasion," by E. J. Herbert.

[6] Engineering, Aug. 14, 1942, Vol. 154, pp. 134-135. "Quenching of Steel after Tempering and the Impact Test," by L. E. Benson.

[7] Metals and Alloys, Vol. 5, 1934, "Effect of Notches on Nitrided Steel," by Johnson and Oberg.

[8] Automotive Industries, Sept. 25, 1937 and Oct. 9, 1937: "Factors Influencing the Durability of Automobile Transmission Gears," by Almen and Straub.

[9] A.S.T.M. Proceedings, Vol. 35, Part 2, 1935, pp. 99-146. "Rear Axle Gears—Factors Which Influence Their Life," by Almen and Boegehold.

[10] Mechanical Engineering, Vol. 45, 1923, p. 579: "Endurance Test Data and Their Interpretation," by Heindlhofer and Sjvall.

[11] Private Communication, R. S. Carter, Goodyear Tire & Rubber Co.

WHICH DO WE WANT?

In 1920, most folks had no money in their pockets. In 194X they will have their pockets full. Quite a difference, you'll agree.

First it spells—"Postwar Opportunity"—because when this war is over there will be, in the United States, the two things it takes to create plenty of business—*money and markets.*

The increase in bank accounts and the buying of war bonds is building up the greatest potential of purchasing power that any nation in the world has ever seen.

When this war is over, our people will have billions in money and a lot of worn-out, obsolete household equipment: refrigerators, radios, and vacuum cleaners, and of course—automobiles.

There will be furious competition, but the business will go to those concerns who have retained this basic principle of merchandising—"Give *more* people the *most* you can for their money."

This can be done by utilizing in peacetime products the new production techniques, new materials and new uses of old materials developed and perfected by the impetus of war.

Industry has learned how Management Engineering can be applied to this job, and has called upon organizations like ours . . . The Trundle Engineering Company . . . to help it secure these advantages in its manufacturing operations.

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES · CLEVELAND · BULKLEY BLDG.
CHICAGO · City National Bank Bldg. · 208 S. La Salle Street
NEW YORK · Graybar Building · 420 Lexington Avenue

Westinghouse Appliance Plans Post-War Policy

Cleveland

• • • **A post-war policy,** outlined by T. J. Newcomb, sales manager of the Westinghouse Electric Appliance Division, Mansfield, Ohio, covers two distinct stages. First, the division will get the same products manufactured prior to the war into production. Improvements will be made, but there will be no radical changes. Second, revolutionary new developments will be brought along as quickly as they can be proved.

It is felt that a line of products that can be obtained for actual selling is the first requirement, and that it would be better to let new developments take a secondary place to immediate needs. Mr. Newcomb emphasized that Westinghouse has its share of new and revolutionary designs for all types of appliances, but it will take time to iron out problems in production, service, and selling. He said that Westinghouse, with its experience in appliance engineering and manufacturing, can better afford to wait until products have been perfected before placing them on the market.

New Control System For Aircraft Output

• • • **Adoption of a new aircraft production planning and control system to bring about increased production of the heavier types of combat aircraft was announced recently by Executive Vice-Chairman Charles E. Wilson.**

Operation of this plan will mean the establishment of a planning and control group under the Aircraft Production Board. This group, which will be set up on a somewhat informal basis, will include representatives of the airframe manufacturers and the producers of various airplane parts, the Aircraft Scheduling Unit, and the Aluminum and Magnesium Division of WPB. Part of the job of this group will be to study inventory positions in the field of fabricated parts.

WPB Distribution Bureau Established in Five Units

• • • **Internal organization** of the Distribution Bureau of WPB has been completed, according to J. A. Krug, program vice-chairman.

This Bureau is divided into five organizational units, including: (1) Office of the Director, (2) Controller Division, (3) Canadian Division, (4) Priorities Control Division, and (5) Compliance Division. W. John Logan is the Bureau Director.

Generally, the Distribution Bureau is established to prescribe a system of accounts and reports relating to the distribution of materials and products; to audit priorities actions; to process priority applications originating in Canada, to process "out-of-line" and special ratings; to obtain compliance with allocation actions, scheduling directives, and priorities orders and regulations of WPB; and to develop policy plans and general methods for the implementation of actions under the priority systems which do not fall under the jurisdiction of the Production Controls Bureau.

TO KNOW YOU'RE RIGHT

use MILLERS FALLS Precision Tools

TO MEET constant demand, Millers Falls micrometer production has been increased several hundred per cent during this war. Typical Millers Falls quality, these are high-precision tools; now used largely in the manufacture and repair of war goods, they'll also be needed in huge quantities for production and maintenance in the mechanized world of tomorrow. Plan now to "tool up" with Millers Falls *quality* micrometers.

THERE ARE 64 kinds and sizes of Millers Falls calipers and dividers — 3 to 12 inches, inside, outside, and hermaphrodite. All are designed to meet the most exacting requirements of skilled machinists and toolmakers. Made of crucible steel, with rounded edges, hardened, ground, and polished. Many features for accuracy, rigidity, and convenience.

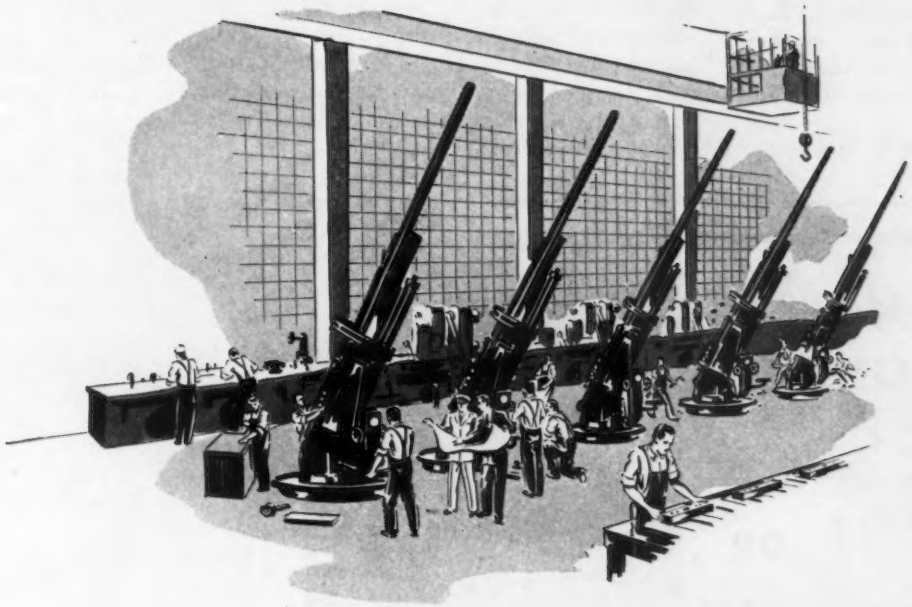
Millers Falls' 75 years of toolmaking "know-how" shows in these *quality* tools.

DESIGNED to make accurate depth measurements of holes, slots, shoulders, and projections, the Millers Falls Depth Gauge is a rugged, precise shop tool. Spindle movement one inch, capacity 0 to 3" by .001"; capacity may be increased up to 12 inches with Millers Falls hardened and precision-ground extension rods. Several special features insure accuracy and long wear — standard Millers Falls *extra* quality.

MILLERS FALLS TOOLS SINCE 1868

MILLERS FALLS CO.
GREENFIELD, MASS., U. S. A.

ALL OUT OF *One Part* STOPS "ALL-OUT" PRODUCTION



YOU can't maintain all-out production when you are all out of even *one* part! Quantities "too little or too late" . . . or off standard quality that forces rejections of parts . . . can seriously penalize the war effort! . . . If one or more difficult parts are hazards to peak production in your plant now, or are "headaches" in your plans for future post-war products . . .

Contact KAYDON

Here is an organization with a staff of engineers who have had decades of experience in metallurgy, precision metal-working methods, and plastics. Their experience is fortified by progressive research, modern laboratory, tool room and quantity production facilities — all of which permit Kaydon to tool up for mass production of difficult high-precision parts, on a speed schedule considered unnecessary before global war problems confronted industry. . . . Kaydon has facilities available now for some additional war production and post-war product development.

For excellence in production of extremely precise, unusually large ball and roller bearings.

THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON, MICH.

Specialists in Difficult Manufacturing

Metal Tradesmen Pledge All-Out Production

Chicago

• • • **A unanimous** pledge for an all-out effort to increase the production of vital war material was taken by members of the National Metal Trades Association in a solemn ceremony marking the close of the Association's recent two-day war production conference.

The members rose, at the close of the annual meeting Thursday, and took this pledge: "In behalf of the entire personnel of our company, I pledge an all-out effort to increase production of vital war material for duration of the war. I pledge the use of every facility to assure America's fighting men on the battlefronts of the world a mountain of munitions and machines to destroy our enemies. This pledge I make as a member of the NMTA in order that the forces of evil which work to destroy our nation's freedoms and our personal freedoms may be abolished for all time, so help me, God."

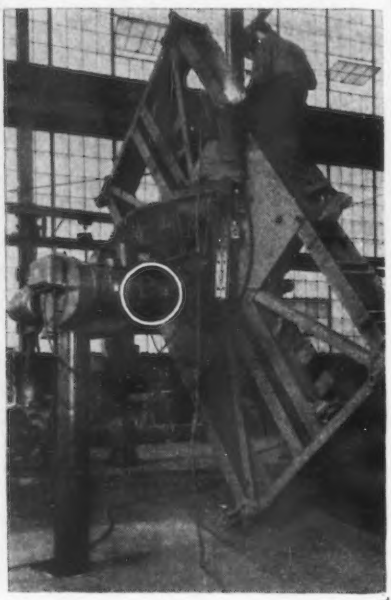
It is planned to hold ceremonies in individual plants.

The association's annual dinner on May 26 was featured by the presentation of awards of merit to "unsung heroes in research and engineering laboratories." The recipients of the awards, who were cited for their ingenuity, inventiveness and resourcefulness in speeding the production of war material, were Oliver W. Bonnafe, Lapoint Machine Tool Co., Hudson, Mass.; John C. Dobyne, Champion Slot Machinery Co., St. Louis, and E. L. Smith, Package Machinery Co., Springfield, Mass.

Bonnafe was cited for the design and development of a semi-automatic broach rifling machine and a breech ring broaching machine. Dobyne received the award for his work in perfecting a machine for banding 20 mm. projectiles, while Smith was cited for the development of fully automatic hopper feed ammunition clip loaders.

Stearns MAGNETIC

BRAKES are IMPORTANT on WELDING Positioners

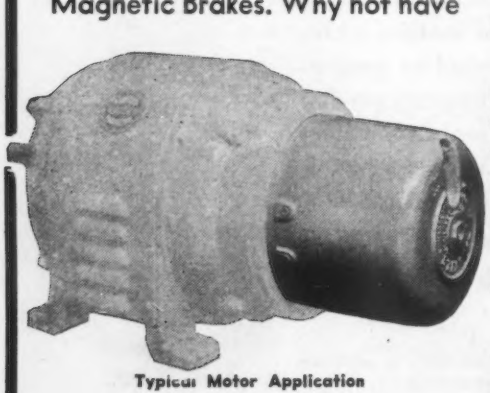


Stearns Magnetic Disc Brakes (in circle) are important for motor control on the popular Cullen-Friestedt welding positioner. They prevent coasting or overrunning of the rotating or tilting tables.

This is only one of many applications efficiently and economically solved with Stearns Magnetic Brakes. Why not have us take a look at any possible problem you may have that requires stopping of rotating machinery. It may be in your plant or in your product.

With our many years of pioneering experience in developing magnetic friction devices it is possible we can be of definitely profitable assistance. We've helped many engineers. How about you?

Write for our Bulletin 604 on Stearns Magnetic Disc Brakes.



Typical Motor Application

Stearns

SEPARATORS DRUMS ROLLS
CLUTCHES PULLEYS
SPECIAL MAGNETS

MAGNETIC MFG. CO.
635 S. 28th St. Milwaukee, Wis.

Canadian War Expenditure To Total Over One Billion

Ottawa

• • • **Defense Minister** Ralston stated in the House of Commons that Canada's war expenditure for the fiscal year 1943-44 will total $1,764,000,000 compared with estimated expenditure of $1,060,508,000 for the 1942-43 fiscal year. The major increase in expenditure for the current fiscal year will come under the categories of pay and allowances amounting to $539,730,211; ammunition and bombs, $273,325,890; armament, including rifles, machine guns, mortars, $123,070,907; and motorized transport vehicles, including trucks, tractors, trailers, tanks, armored fighting vehicles and repair parts, $371,853,674.

Slab Mill Record Believed Set at South Works of C-I

Chicago

• • • **Production of** 6932 tons of steel was achieved during a 24-hr. period by the crew of the 44-in. slabbing mill at south works of Carnegie-Illinois Steel Corp. This feat, which is believed to be a record, was added to the already impressive total of production records credited to that plant.

A Fire Fighter That Snorts Snow!

The scene: A U. S. Army Airport. On his first "solo" a flying cadet overshoots his field—his plane noses over and smashes his gas lines. In an instant the plane is in flames and his life is in danger. Suddenly, a strange looking truck appears just a few feet from the raging inferno—shooting sub-zero carbon dioxide "snow" and vapor onto the blazing plane, as it approaches. Twenty seconds later not a flame is visible!

Soon many of these Cardox Airport Fire Trucks will be on duty at Army air fields . . . ready at a moment's notice to snuff out the flames of a burning plane, and save many a precious life among Uncle Sam's pilots and other air corps personnel!

The especially hard, tight finishes, which these Cardox trucks must have to withstand both extreme heat and extreme cold, are applied with DeVilbiss Spray Painting Equipment—flawlessly and uniformly.

This is just one of the innumerable, interesting ways in which DeVilbiss is helping in *all* fields of war production. Whether you are making bullets, battleships or fire fighters, there's a DeVilbiss Spray System that will help you save precious time wherever there is a painting, coating or finishing operation.

THE DEVILBISS COMPANY • TOLEDO, OHIO
Canadian Plant: WINDSOR, ONTARIO

PROUD to have won the coveted Army-Navy "E" for excellence in war production, the men and women of DeVilbiss pledge to continue giving their all-out best—for Victory.

DeVILBISS
SPRAY SYSTEMS

SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

Purchase of Allotments Eased By Amendment to Regulation No. 1

Washington

• • • To avoid confusion WPB last week amended CMP Regulation No. 1 so that manufacturers can buy allotments as they are needed during a quarter. Heretofore manufacturers were required to make percentage purchases of 40-30-30 during that period. Announcement that monthly percentage restrictions had been eliminated was made by Walter C. Skuce, Director of the CMP Division.

Allotments, as well as applications for allotments, will be made on a quarterly basis, rather than on a monthly basis as was originally required under CMP, except as may be otherwise required in any particular allotment or application form.

The numerical method of identifying months and quarters previously prescribed has been abolished, effective July 1. It does not apply to orders placed, or allotments made, before then. Allotments will be required to show the quarter for which purchase authority is valid instead of the quarter number formerly used. For example, "3rd quarter 1943" will be used instead of "19." The phrase "3rd quarter 1943" may be abbreviated as "3Q43."

Orders for controlled materials must indicate the month delivery is required instead of a month number—for example, "July, 1943," as well as the quarterly identification which is shown in the same manner as in the case of making an allotment of controlled materials.

The symbols, B, G, J and K will be used to identify certain B product programs. This is in conformity with the recently established B product designations, reflecting end-use, which were announced some time ago. The symbol RO will be used by regional offices of WPB.

The regulation is clarified by the amendment specifically indicating that no manufacturer may place an authorized controlled material order unless the amount of the controlled material required is within the related allotment which he has received, after he has deducted all allotments made by him and all orders for controlled materials placed by him pursuant to the same allotment, unless he is specifically authorized to do so by an order or regulation of WPB.

The regulation has also been amended to provide that persons using the small order precedure to obtain Class A products requiring small amounts of controlled materials, need not reduce the allotments which they have received by the amount of the controlled material required.

The Controlled Materials List is modified in the following manner:

1. Both carbon and alloy steel die blocks are included as controlled materials.
2. The term "pipe" (both carbon and alloy steel) is clarified to indicate that it includes threaded couplings of the type normally supplied on threaded pipe by pipe mills.
3. Listings of both copper and copper base alloy products are spelled out by the amendment in greater detail than they have heretofore been.

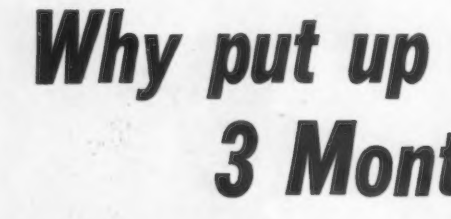
Schedule III, reflecting numbers of days orders for controlled materials must be placed in advance of the first day of the month in which deliveries are requested, has been amended with respect to tubing.

Schedule IV has been amended with respect to minimum mill quantities for tubing.

Certain provisions relating to

Why put up with 3 Months' Life

when tires like these last a year or more?



IN THIS FOUNDRY where a set of Simpson tires are working in silica sand, the normal life of an ordinary tire is only three months! But now, since the tires have been given a hard-facing overlay of Coast Metals, no appreciable wear is evident after a year's continuous service!

By making parts, that are subjected to wear, exceptionally resistant to abrasion, impact, and shock, Coast Metals hard-facing assures longer equipment life. It eliminates the need for frequent repairs and replacements, reduces shutdowns, and steps up production.

Easily applied either by the electric welding arc or the oxy-acetylene torch to new or old parts of ferrous metals, Coast Metals hard-facing is today's wartime answer to solving difficult wear-resistance problems. Our engineers will gladly tell you how it can meet *your* particular needs.

COAST METALS, INC.

Plant and General Offices: Canton, Ohio • *Executive Offices:* New York, N.Y.

COAST METALS *hard-facing weld rods*

YOUR EQUIPMENT'S LIFE PRESERVER AGAINST WEAR

orders placed with controlled materials producers are clarified in interpretation No. 8 to CMP Regulation No. 1, issued by the War Production Board simultaneously with the issuance of CMP Regulation No. 1, as amended May 28.

Controlled material allotments made to a consumer for a particular calendar quarter or other specific period indicated on the allotment certificate may not be used for placing authorized controlled material orders for any other period.

Under the terms of the regulation, a consumer must specify on his authorized controlled materials order the date of the month in which delivery is requested, within the period for which his allotment is valid. The mill is required to make delivery as close to the delivery date as practicable.

The provision that a controlled materials producer is permitted to make deliveries up to 30 days after the last day of the month in which delivery is requested, applies only to orders which were accepted on the basis that they could be filled by the required delivery date. In such cases, it is permissible to make delivery even though the month in which shipment is made is after the end of the quarter for which the allotment is valid. A controlled materials producer may not accept orders if he does not expect to be able to fill them during the delivery month requested.

If an order for a given month is rejected by a controlled materials producer because he cannot make delivery during the month requested, the consumer may apply for assistance to the appropriate controlled materials division either directly, or through the Claimant Agency or Industry Division which made the allotment. If he does not require delivery the same month, he may postpone it to a month later in the same quarter, and if the mill expects to be able to meet the new delivery date, it may accept the order.

If the mill cannot fill the order until some time in a subsequent quarter, it may accept the order only if the consumer has an allotment balance for the subsequent quarter sufficient to cover the order. The consumer cannot use allotments made for one quarter to cover orders for delivery in subsequent quarters even if he has not been able to obtain deliveries on all of the allotments made to him for a previous quarter.

At the same time Interpretation No. 5, CMP Regulation No. 1, has been revised. As originally issued April 20, 1943, the interpretation stated in effect that where WPB has expressly authorized or directed the filling of an order, the order is to be treated as an authorized controlled material order received on the date of receipt of the authorization or direction by the producer. This portion of the interpretation has been deleted.

Interpretation No. 7 has been revised to indicate that a manufacturer of a Class A product is entitled to obtain an allotment from his customer even if the product ordered could be produced from inventories on hand. This is applicable where the use of the inventory material would reduce the manufacturer's stocks below a minimum practicable working level. However, attention is called to the fact that inventory limitations of CMP Regulation No. 2 must be observed.

Foundry Committee Meets Steel Division on Problems

Washington

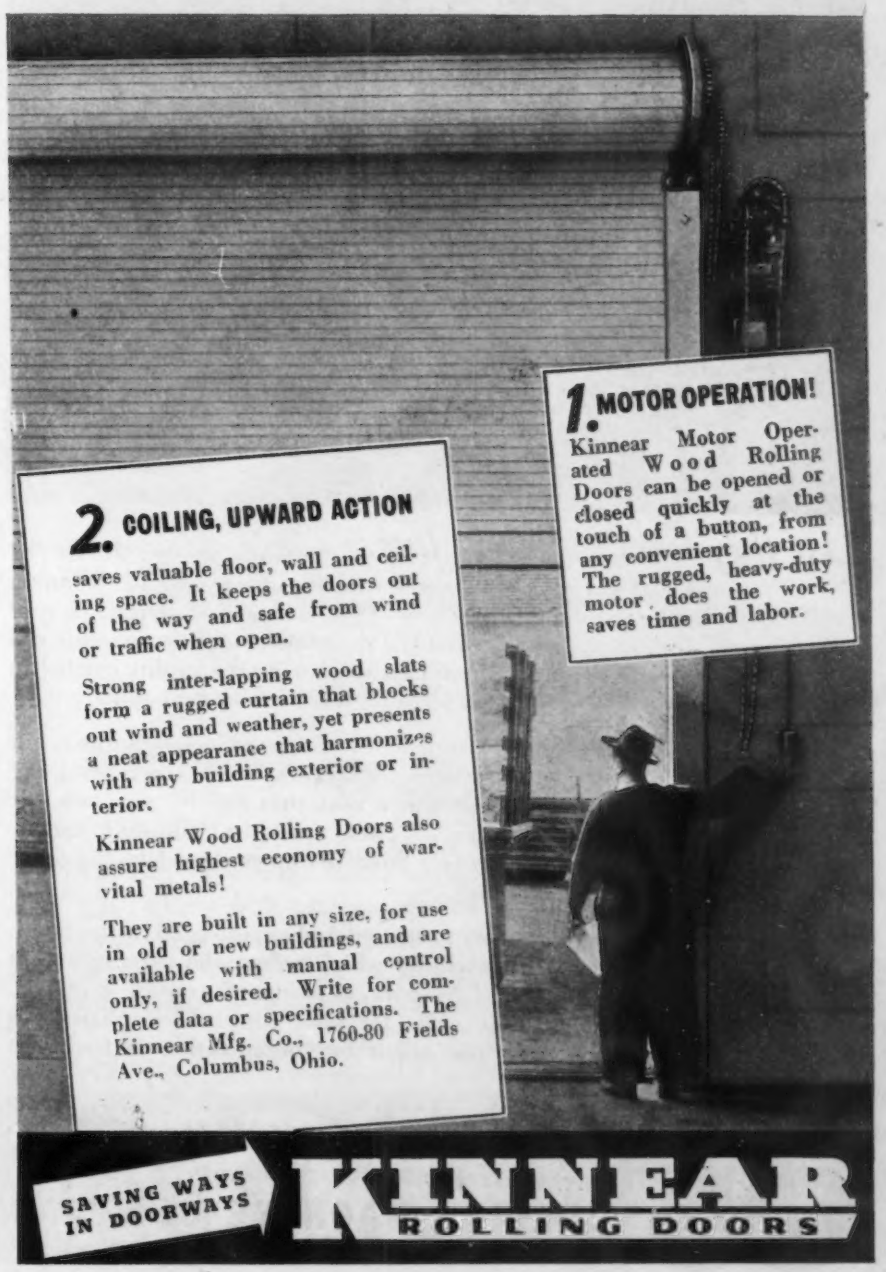
• • • **Problems in the use** of alloying metals for foundry products, together with an analysis of the foundry raw materials situation were outlined by WPB Steel Division officials to the Ferrous Foundry Industry Advisory Committee at a recent meeting. The organization of four technical subcommittees to work with the full committee also was announced.

The meeting was told by E. D. Pratt of the Steel Division Metallurgical and Conservation Branch that requests for nickel, chromium and molybdenum in May were lower on a tonnage basis than in April but that total molybdenum requirements were in excess of supply.

Declaring that proper utilization of alloy steel scrap remains one of the most urgent problems, E. J. Hergenroether, deputy chief of the Metallurgical and Conservation Branch, said that in some instances there has not been full compliance with Order M-24-c, which requires segregation of scrap by classes.

It was brought out that producers of foundry products who desire to use copper scrap must note that fact on the PD-707 form submitted to the Steel Division for allocations of alloying metals. The use of copper scrap in ferrous foundry products will not be authorized by the Copper Division unless the request is screened first by the Steel Division through the PD-707 form.

KINNEAR *Motor Operated* WOOD ROLLING DOORS OFFER 2 WARTIME ADVANTAGES


1. MOTOR OPERATION!
Kinnear Motor Operated Wood Rolling Doors can be opened or closed quickly at the touch of a button, from any convenient location! The rugged, heavy-duty motor does the work, saves time and labor.
2. COILING, UPWARD ACTION
saves valuable floor, wall and ceiling space. It keeps the doors out of the way and safe from wind or traffic when open.
Strong inter-lapping wood slats form a rugged curtain that blocks out wind and weather, yet presents a neat appearance that harmonizes with any building exterior or interior.
Kinnear Wood Rolling Doors also assure highest economy of war-vital metals!
They are built in any size, for use in old or new buildings, and are available with manual control only, if desired. Write for complete data or specifications. The Kinnear Mfg. Co., 1760-80 Fields Ave., Columbus, Ohio.
SAVING WAYS IN DOORWAYS
KINNEAR
ROLLING DOORS

GMPR Still Fixes Bolt and Nut Ceilings

Washington

• • • **To give clarity** to its recent Price Interpretation No. 22, issued on May 24, OPA on Monday explained that the General Maximum Price Regulation still establishes, in general, the maximum prices for bolts, nuts, screws and rivets. Maximum prices under this regulation are the highest charged by the individual seller on a similar sale during March, 1942.

In the interpretation it was stated that a wholesaler or distributer who bought bolts nuts, screws and rivets from a manufacturer and customarily received "a manufacturer's discount" was required to price his products for resale under Maximum Price Regulation No. 147.

The OPA stated that the interpretation had improperly referred to "a manufacturer's discount" instead of "a manufacturer's exchange discount" which requires that a manufacturer who purchases from another manufacturer to price the purchased item for resale under Maximum Price Regulation No. 147.

It was pointed out that wholesalers and distributors, unless they are also manufacturers, would not in the course of general trade receive "a manufacturer's exchange discount." OPA, therefore, is instructing all wholesalers and distributers who are not producers to disregard the interpretation and to continue to price their bolts, nuts and screws under the General Maximum Price Regulation.

•

Container Makers Asked to Report Material Consumption

Washington

• • • **In a letter to** manufacturers of containers and closures, Roswell C. Mower, director of the WPB Containers Division on Monday requested manufacturers to supply periodic reports on their production and consumption of various types of materials and closures. The reports are to be filed, on specified forms, with the program section, Containers Division, WPB, Washington.

•

Steel Strapping Relaxed

Washington

• • • **WPB on Monday** amended conservation order M-261 to permit the use of steel strapping for several additional purposes. Also, the definition of steel strapping was amended to allow the use of strapping for fastening together a group of filled containers into one unit.

•

Territorial Prices Not Set By Export Price Regulation

Washington

• • • **OPA on Monday** announced revision of the Export Price Regulation effective June 12, so that it will not operate to permit sales in United States territories and possessions at prices in excess of those established by any maximum price regulation applicable to a sale in the territories and possessions to a purchaser within them. However, sales by exporters in the Continental United States to

Lest they loom too large later, start your plans now for the period which will follow the winning of this war. . . . Winning is the paramount task now. It is but the first step to Victory —which will be achieved and maintained only by an industrial transition, quickly stabilized to provide the profits needed to pay for the rehabilitation of a war-torn world population.

Winning involves fighting and bonds and blood donations, but Victory will call for new or revamped products and the machines to make them at a cost that will let you face the competition of Peace. . . . Such machines will take time—months of it—to convert from design or model to the practical production stage.

FIDELITY, thoroughly grounded and experienced in the building of successful machines which reflect the ingenuity that has made Industrial America, is prepared to work with you. . . . As a first step, write for your copy of "Facilities"—a booklet that tells you about our organization and what it can do for YOU.

Designers and Builders of Intricate, Automatic Precision Machines

32 YEARS' EXPERIENCE

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.

Pig Iron Record Set At Great Lakes Steel

Pittsburgh

• • • **A new world record in monthly pig iron production from a single blast furnace was set in May, according to George R. Fink, president of National Steel Corp., who announced June 4 that the "B" furnace of the Great Lakes Steel Corp., Detroit division, had produced 49,705 net tons of iron, or a daily average of 1603 net tons.**

The Great Lakes furnace's operation for May was 30 per cent over its officially rated capacity of 1232 net tons daily. Total weight of pig iron produced was more than 6000 tons in excess of the furnace's best previous month—43,478 tons in March, 1942.

buyers in the territories or possessions will continue to be governed by the Second Revised Maximum Export Price Regulation so long as the sale does not take place in the territories.

•

Recent WPB Changes

Washington

• • • **William K. Frank** was appointed last week as Director of the WPB Equipment Bureau. Mr. Frank, formerly Director of the General Industrial Equipment Division, succeeds **Harry Rapelye**, who has resigned to resume his executive position with the Continental Can Co., New York. Prior to coming to Washington in 1914 to join OPM.

Fred W. Gardner, former Director of the Cork, Asbestos & Fibrous Glass Division was appointed as Director of the General Industrial Equipment Division and **William T. Meloy**, Deputy Director of the Cork, Asbestos & Fibrous Glass Division as director of that division.

Established Prices Justified

• • • **"Regularly established prices,"** as the term is used in Priorities Regulation No. 1, cannot be regarded as higher than the ceiling prices established by the OPA, according to a ruling announced last Thursday by the WPB.

This interpretation of Regulation No. 1 means that a manufacturer or other vendor may not reject an order bearing a preference rating on the ground that the price offered is below the regularly established price, if the purchaser meets the OPA ceiling.

Ratings Extended For Facilities Use

Washington

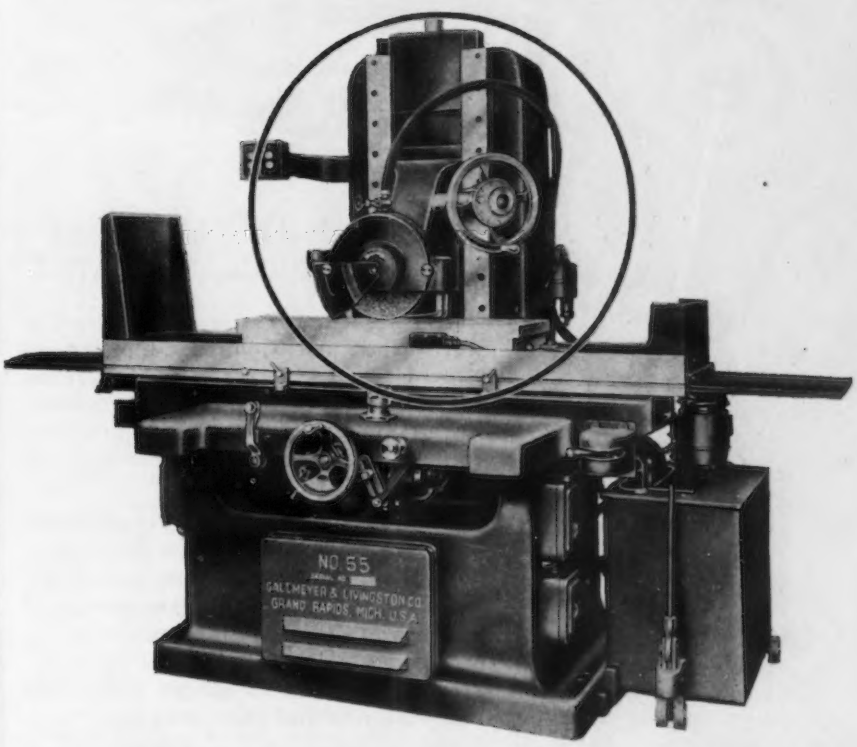
• • • **Priorities Regulation No. 3**, governing the application and extension of preference ratings, has been amended to provide uniform methods in applying ratings to obtain preferential use of processing and fabricating facilities. Previously, this privilege was confined to PRP units operating under Priorities Regulation No. 11. By recent amendment of Priorities Regulation No. 1, the WPB provided for the assignment by others of ratings to the use of facilities as well as to the delivery of materials. The amendment of Regulation No. 3 adds provisions telling how these ratings may be used.

The changes, announced on Monday, provide that:

(1) A rating assigned by WPB to permit a named person to obtain use of par-

GRAND RAPIDS

Precision Grinders



THIS hydraulic feed surface grinder combines rigidity with extreme accuracy. Patented vernier control graduated in .001". Split tenths even on production job. Table Speed to 125ft/min. Table movement 13½x38". Table Size 12x36".

Catalog GL-100 on request.

GALLMEYER & LIVINGSTON CO.

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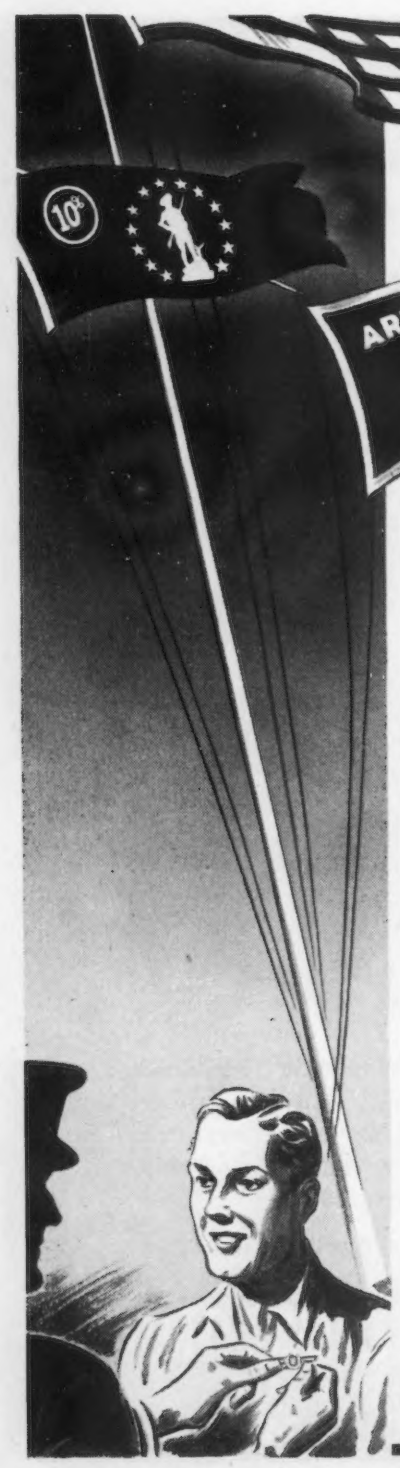
GRAND RAPIDS MICHIGAN

ticular facilities may be applied only by that individual, and then only to the specified facilities; (2) when a person is authorized to apply or extend a rating to obtain material which he will deliver, or which he will incorporate in material to be produced or delivered, he may make use of the same rating to obtain use of the facilities of a concern regularly engaged in the business to process the rated material; (3) a person to whom a rating has been extended to obtain use of his facilities may not himself extend the rating for any purpose.

Other changes effected in Regulation No. 3 restrict or eliminate the use of preference ratings to acquire certain materials and products. These are divided into three groups.

List A of the amended regulation names products and services which, by reason of being in adequate supply, may be delivered without regard to preference ratings. Application of ratings to the purchase of any of these is specifically prohibited.

List B contains items not subject to any ratings assigned to the acquisition of maintenance, repair and operating supplies. Ratings assigned for other purposes, however, may be used to obtain these. Only ratings assigned or authorized by specified M and P orders may be used to obtain delivery of any of the items included in List C. Certain other minor changes, largely technical in nature, are also effected by the amended regulation.



"WE WON IT BEFORE—
WE'VE WON IT AGAIN!"

"NOT ALL of us were present back in 1917 when our Company received an Award from Secretary of War Newton D. Baker 'for Distinguished Service, Loyalty, Energy and Efficiency in the Performance of War Work'—but some of us were.

"And the records these Alvey-Ferguson men hung up during the First World War have been a great inspiration to all of us!

"Long before Pearl Harbor we started to break our previous records in turning out conveying systems and metal products cleaning and finishing equipment took on a new and fuller meaning.

"Naturally, we are proud that our work has been recognized and that the Army-Navy "E" flag 'for excellence in the production of materials for war' flies over our plant.

"We're going to keep that "E" flag flying until Victory is ours—not only on the production front—but on the war front!"

THE MEN AND WOMEN OF
THE ALVEY-FERGUSON CO.

717 DISNEY ST. A-F CINCINNATI, O.

ENGINEERS AND MANUFACTURERS OF CONVEYING SYSTEMS AND METAL PRODUCTS CLEANING AND FINISHING EQUIPMENT

New Form Numbers Due on WPB Forms

Washington

• • • **A simplified system** of identifying WPB Forms is being put into effect as present stocks are exhausted and reprinting becomes necessary. WPB officials have announced that all forms in the WPB, PD, UF and RD series and many in the CMP series which must be filled out and returned to WPB by manufacturers and others will eventually bear only the initials WPB, followed by new serial numbers. Letters of instruction will be identified by the designation WPBI and assigned serial numbers.

All authorization, allocation and other form stationery used by Industry Division and field officers will carry the prefix GA (General Administrative), provided it does not seek information from industry. All letters and booklets of general information not having to do with the administration of any particular order or regulation will continue to be identified by the initials Infl.

•

Crown Manufacturers Plan National Search for Steel

Washington

• • • **Crown manufacturers** have inaugurated a campaign to comb the country for steel, particularly blackplate, which has been frozen in the hands of various manufacturers by

Priority Changes

L-38—Amended order provides that purchase orders for maintenance and repair parts for industrial and commercial refrigerating and air-conditioning equipment must bear preference ratings of A-5 or higher. (5-28-43)

•

L-89—Amended order modifies restrictions on the sale and purchase of maintenance parts of elevator equipment. (6-3-43)

•

L-192—Amended order removes the prohibition of the sale of certain types of construction machinery and equipment in inventories. (6-1-43)

•

L-216—Schedules II and III simplify the production of wrenches, pliers and nippers. (5-31-43 Schedule IV cuts from 380 to 70 the number of sizes in which rotary files are produced. (6-3-43)

•

L-296—Directive No. 1 authorizes Ducommon Metals & Supply Co., Los Angeles; Supply Division, Inc., Robertson, Mo.; and Aircraft Hardware Mfg. Co., New York, to stock and deliver aircraft hardware, valves and fittings. (6-5-43)

•

M-293—Amended order adds alloy steel studs and headed bolts for high temperature service to the list of critical common components subject to scheduling control by the Building Materials Division. (5-31-43)

Use of More Scrap Result of Coal Strike

• • • The coal strike last week was seen by some observers as pushing forward the time when scrap again will become an acute item for the industry. With at least 13 blast furnaces down from lack of coke at the week's end and several more in the nation down due to repairs, a hot metal shortage is causing greater use of scrap in some mills which may be eating away irreplaceable scrap stocks.

WPB conservation orders, the Crown Manufacturers Industry Advisory Committee told WPB officials at a meeting in Washington. Use of prime steel for the manufacture of crowns (chiefly for bottletops and closures) is prohibited by WPB. However, tinmill blackplate rejects and electrolytic waste-waste may be used for crowns.

The crown industry was advised to report any metal located to the WPB Containers Division. If the metal is determined to be unfit for a more essential war use, authority to purchase it for the manufacture of crowns will be granted.

It is estimated that approximately 15 per cent of the current consumption of crowns is being used to bottle beverages for the armed forces.

•

Ceiling Price Formula Set For New Flange Producers

• • • Methods for establishing ceilings for cast steel, forged steel, and steel plate flanges sold for use in the war program by new producers who cooperate in the government program to ease a temporary nationwide shortage by undertaking production of these articles were announced Tuesday by OPA.

To cover handling costs, a mark-up of 11 per cent over total production costs is fixed as a maximum for new producers who use the facilities of small foundries and machine shops on a subcontracting basis to augment the current production of flanges. All present producers are operating at full capacity and are confronted with a backlog of orders.

The action—contained in Amendment 6 to Order A-1 under MPR No. 188—coincides with the War Production Board's program encouraging distributers to enter production.

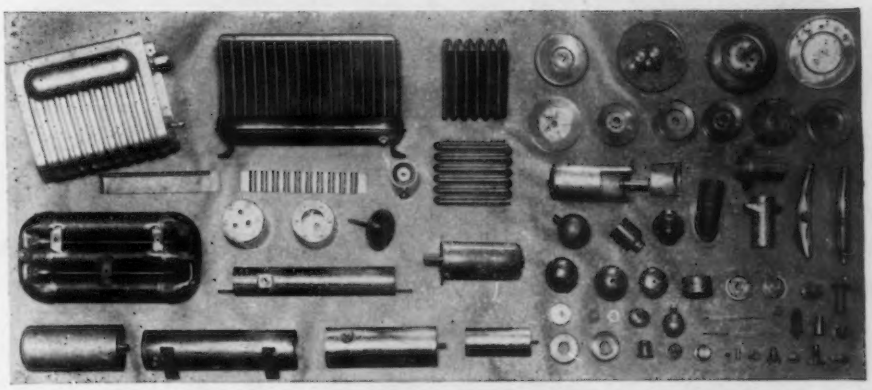
New Officers Named

• • • At the business meeting of the 11th annual convention of the Electric Steel Makers Guild, Inc., the following officers were elected for the year beginning July 1, 1943: president, James C. Sweitzer, Sivyer Steel Casting Co., Milwaukee; vice-president, Alex C. Texter, Atlas Steels, Ltd., Welland, Ont., Canada; secretary - treasurer: John E. Arthur, Crucible Steel Co., of America, Park Works, Pittsburgh.

Canadian Agencies Are Eligible to Use CMP No. 5A

Ottawa

• • • C. D. Howe, Minister of Munitions and Supply, has announced that authorized government agencies and institutions in Canada are eligible for use of the provisions of CMP Regulation No. 5A. Authorization may be obtained on application to WPB through the Department of Munitions and Supply, here. However, use is subject to conditions.



Some parts and products joined by the electric furnace copper brazing process—assemblies ranging in size from small metal radio tube parts to large automotive and refrigerator units are joined neatly, securely and economically by this process.

Design Your Metal Parts For Copper Brazing

Miscellaneous steel assemblies are joined 60% to 75% faster at ¼ the former labor cost by the copper brazing process

"Greatly improved results—neater, stronger joints—60 to 75% faster, at about one-quarter the former labor cost," that briefly is the report received from the production manager of a prominent midwestern plant after installing an EF continuous copper brazing furnace for joining some of their steel assemblies.

Within a month after installing their first brazing furnace, a second similar but larger furnace was ordered for joining other products—both furnaces are now operating side by side, joining all kinds of assemblies—large and small—neatly, economically and securely.

Products difficult or expensive to make in one piece can be made in several pieces and joined — thus not only reducing the cost but actually improving the quality and appearance. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in the production line in your shop. Strong, leak-proof joints are made and the completed unit is discharged from the furnace—clean and bright.

Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are made to actually "grow together," and joints made which are as strong, or even stronger than the original parts.

Investigate the brazing process for your products. With slight changes in design you may be able to join your metal assemblies, neater, cheaper and stronger by this method.

Send for printed matter showing various types of EF copper brazing furnaces.

Investigate the Copper Brazing Process for Joining YOUR Metal Parts

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

Adopt New Grinding Wheel Markings

• • • **A new American Standard** (ASA B5.17-1943) "Markings for Grinding Wheels" has recently been approved by the American Standards Association. It is one of a series of standards for small tools and machine tool elements sponsored by the SAE, ASME and the National Machine Tool Builders Association. The new standard is identical with the one developed about three years ago by the Grinding Wheel Manufacturers Association in collaboration with General Motors Corp. Symbols are provided for:

Abrasive (eight types)
Grain size (28 grit sizes)
Hardness or grade (21 variations)
Structure (nine variations, three preferred)
Bond or process (six variations)
Manufacturers record (to suit)

Copies of the standard are obtainable from the American Society of Mechanical Engineers, 29 West 39th Street, New York, at 25c. a copy.

In a recent issue of "Grits and Grinds," the Norton Co., Worcester, Mass., points out that the grade and bond symbols, though correct as far as they go, cannot adequately describe grinding grade, except as showing the relative hardness of wheels made by the *same* manufacturer. Numerous variations in each general type of bond and in methods of manufacture result in important differences in grinding action between wheels of the same nominal grade and bond type; hence the new wheel marking system cannot be used alone but must be used in conjunction with the wheel maker's own marking.

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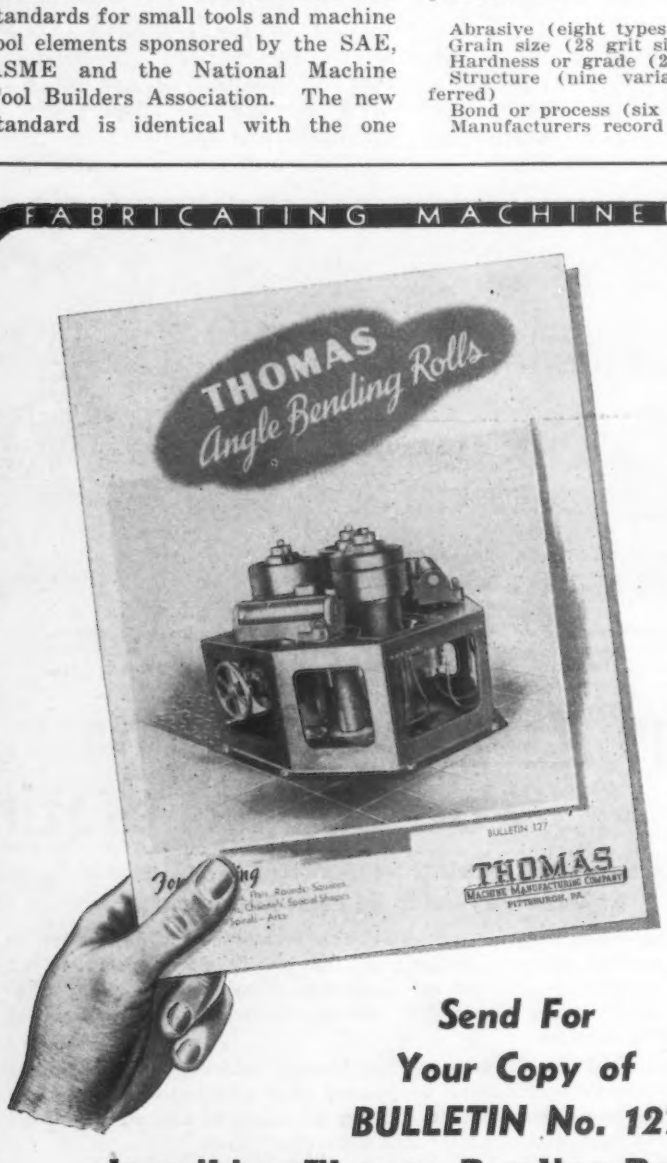
PRESSES • DIES • METAL-FORMING MACHINERY

BENDING AND STRAIGHTENING MACHINES • MULTIPLE DRILLS



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. . describing Thomas Bending Rolls

Thomas Bending Rolls are made in Horizontal and Vertical Types, and accurately and economically meet your requirements for bending Angles, Tees, Flats, Rounds, Squares and other special shapes. Either type is entirely self-contained and embodies features that promote ease of operation and utmost serviceability. Write for Bulletin 127 today.

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MACHINE MANUFACTURING COMPANY
PITTSBURGH, PA.

Hard Facing Materials Restricted to AA-4 Orders

• • • **Repair and maintenance** of certain agricultural machinery will be facilitated by Order L-223 as amended Friday which permits the use of certain low-alloy hard-facing compositions for such purposes on orders rated AA-4 or higher. The compositions permitted by the amended order are lower in alloy content than those normally used.

The amended order also tightens control on all uses of hard-facing material by restricting deliveries to orders rated AA-4 or higher for maintenance or repair of specifically mentioned end-products. Previously, the preference rating requirement was AA-5.

The amended order also eliminates the filing of Form PD-733, and adds equipment for the production of welding electrodes as a permitted end-use.

Armor Plate Termed A Product

• • • **Rolled armor plate** which is further processed by a controlled material producer or any other processor is a Class A product, the WPB announced last week. This is true, according to Direction 10, CMP Regulation No. 1, whether the shape of the armor plate is changed or not. Forged armor plate, irrespective of its form or shape, is a Class A product and not a controlled material.

Talmage Named to ODT

• • • **Appointment of George** E. Talmage, Jr., New York, as assistant director of ODT's Division of Traffic Movement, in charge of the Export-Import Traffic Section, was announced by ODT on Saturday.

Fighting Men Take More Steel Than in '17

• • • **Today's American soldiers, sailors and marines require annually the production of approximately 1500 lb. more steel per man than their fathers did in the first World War. Furthermore the forces today are being equipped with steels vastly superior in quality, according to the American Iron and Steel Institute.**

For each of the estimated 7,000,000 men in the United States armed forces at the end of 1942, the American steel industry poured over 24,600 lb. of ingots in the course of its record-breaking production of 86,000,000 tons. In World War I an output of approximately 23,100 lb. of steel per man is indicated. The output figures for both World War I and 1942 include production of steel for all purposes, including export. High-quality alloy steel production last year exceeded 11,350,000 tons, or somewhat more than 3240 lb. for every man in service. In 1918 about 920 lb. per man was made.

Ratings for Steel Flanges Raised in War Standard

• • • **Higher pressures** have been authorized for steel flanges, flanged fittings and valves used in water, steam and oil pipe lines in an American War Standard (B16e5-1943) approved recently by the American Standards Association. The new standard temperature-pressure ratings are revisions of Tables 6 through 11 of the American Standard for Steel Pipe Flanges and Flanged Fittings (B16e-1939). These ratings are expected to result in increased economy in the use of steel for pipe lines, thus helping in the country's steel conservation program.

Copies of the American War Standard are available from the American Standards Association, 29 West 39th Street, New York at 25c. each.

New Pipeline Approved

• • • **Construction of a** 383-mile, 16-in. pipeline from Sundown, Tex., to Drumright, Okla., having an initial capacity of 54,000 barrels of crude oil daily, was approved June 4 by WPB upon the recommendation of Petroleum Administrator for War, Harold L. Ickes. Some 44,600 tons of steel and $7,000,000 will be required to build the new line.

Directors Appointed to Facilities Bureau Divisions

Washington

• • • The organization of the Facilities Bureau has been completed with the appointment of directors for each of the three divisions, Charles E. Volkhardt, director, announced last week.

The following appointments were announced—F. J. C. Dresser, director of the Projects Division; J. B. Campbell, director of the Production Resources Division; W. E. Mullestein, director of the Progress and Scheduling Division.

Mr. Dresser had previously been director of the Construction Division, whose functions have been absorbed by the Projects Division. Mr. Campbell has been on the staff of the Facilities Division, and Mr. Mullestein has been associated with the Facilities Program Division.

BOEING Grind Shear Blades on this ROGERS "NT" GRINDER

One of Many Installations in Leading American Plants Where ACCURACY and DEPENDABILITY are Paramount!

Rogers Knife and Shear Blade Grinders are proving again their *rugged reliability* under war-time pressure schedules. They make you independent of costly delays and *unnecessary wear.*

Rogers Grinders Conserve Knives

Finely adjusted automatic control assures keen cutting edges . . . with *minimum removal of metal.* Reasonable shipments to high priority holders. Write for Circular "N. T."

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ROGERS "NT" KNIFE GRINDER

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PRECISION QUALITY SINCE 1887

PERSONALS

• **W. A. Mann** has been appointed assistant manager, Industrial Division of General Electric's central district, Chicago. Mr. Mann became associated with General Electric's turbine department at the Schenectady Works in 1923. Later the same year he entered the test course there. In 1925 Mr. Mann was transferred to the industrial engineering department at Schenectady, and early in 1926 he was transferred to the industrial department there. Soon after, he was transferred to the Chicago office.

• **V. H. Peterson**, for the past two years vice-president of the Elliott Co., has been appointed assistant to the president of the Baldwin Locomotive Works, Philadelphia. In 1938, after serving as sales engineer in the Pittsburgh office and as district manager of the Rochester and Washington, D. C., offices of the Elliott Co., he returned to the headquarters office at Jeannette, Pa., as assistant to the president in coordinating the sales activities of the company. In 1941 he was elected a vice-president of the company with responsibility for all the sales, advertising and service activities of their three plants, which position he left to join the Baldwin Locomotive Works.

• **Edward Shaw, Sr.**, formerly New England sales representative for the Producto Machine Co., Bridgeport, Conn., has joined the Moore Special Tool Co., Inc., also of Bridgeport, as sales manager. Mr. Shaw was associated with Producto for 28 years, the last 15 of which were devoted to the New England territory.

• **R. Elliott Maxwell**, vice-president and director of the Whiting Corp., Harvey, Ill., as been appointed export manager, with headquarters in New York. Mr. Maxwell was for many years connected with the Carnegie-Illinois Steel Corp., Pittsburgh.

• **Richard D. La Fond** was recently appointed director of public relations of Sperry Products, Inc., Hoboken, N. J. Before coming to Sperry, Mr. La Fond was sales promotion manager for the Dresser Mfg. Co., Bradford, Pa., and before that he was connected with the industrial advertising section of the General Electric Co., Schenectady.

• **W. S. Edsall** has been appointed manager of a newly combined switchgear and control division of Allis-Chalmers, Milwaukee. Mr. Edsall will come to Milwaukee from the Boston Works where he has been in charge as manager of the switchgear division.

W. A. MANN, assistant manager of the Industrial Division of General Electric Co.'s central district, Chicago.

• **Walter E. Ellsworth** was recently elected chairman of the Indianapolis chapter of the American Society for Metals. He has been Indianapolis manager of the Claud S. Gordon Co. since 1939.

• **W. H. S. Bateman** of W. H. S. Bateman & Co., Philadelphia, recently celebrated his 50th year in the iron and steel business. Incidentally, he observed his 75th birthday on June 3.

V. H. PETERSON, assistant to the president of the Baldwin Locomotive Works, Philadelphia.

• **W. H. Houghton** has been elected treasurer and **Arthur Raabe** vice-president and group executive of Bendix Aviation Corp. Mr. Houghton has been comptroller of Bendix for 14 years. Mr. Raabe has been associated with Bendix for several years.

• **Ralph L. Hohnhorst** has been appointed representative of the Connecticut district for the machinery division of Austin-Hastings Co., Inc., Cambridge, Mass.

• **W. K. Cooper** has been named vice-president in charge of sales of the Aviation Corp. His office will be in Washington. Mr. Cooper entered the aviation field in 1938 when he joined the Lycoming division of the Aviation Corp., Williamsport, Pa., after having served for several years with the New York Shipbuilding Corp. After three years as general manager of the Lycoming Division he became general sales manager of the Aviation Corp.

• **S. Clay Williams**, chairman of the R. J. Reynolds Tobacco Co., was recently elected chairman of the National Industrial Conference Board for 1943-1944. Mr. Williams succeeds Fred I. Kent, president of the Council of New York University. Vice-Chairmen of the Conference Board, elected for one year, were: **Neal Dow Becker**, president of the Intertype Corp.; **Col. J. F. Drake**, president of the Gulf Oil Corp.; **Edgar M. Queeny**, chairman of the Monsanto Chemical Co., and **Langbourne M. Williams, Jr.**, president of the Freeport Sulphur Co. **Dr. Virgil Jordan** was elected president and chief executive officer of the Board and **James L. Madden**, third vice-president of the Metropolitan Life Insurance Co., was elected treasurer.

• **Palmer Nichols** has been named president of Bendix Aviation Ltd., North Hollywood, Cal., a subsidiary of Bendix Aviation Corp. Mr. Nichols will continue the function of general manager of the subsidiary.

• **A. R. Johnson** has been appointed by the Young Radiator Co., Racine, Wis., as California sales representative with headquarters at Los Angeles. He formerly was with the Guy F. Atkinson Co. there.

• **J. W. St. Clair**, vice-president of the Hajoca Corp., Philadelphia, has been elected secretary of the Philadelpia Control of the Controllers Institute of America. **Charles L.**

Jones, assistant treasurer of the Alan Wood Steel Co., Conshohocken, Pa., was reelected a director.

• **F. M. Beauregard** has been appointed works manager of Willys-Overland Motors Inc., Toledo. Before joining Willys, he was general manager for Crosley Corp., and has also been associated with Nash-Kelvinator and Westinghouse.

• **V. E. Blue**, employment supervisor of the Dodge Division of Chrysler, has been appointed to the staff of C. T. Winegar, director of personnel for Chrysler. Mr. Blue has been with Dodge since 1916. His place as employment supervisor at Dodge is being taken by **Carl E. Hustedt**, former assistant in the office.

• **Thomas J. Connors** has been appointed New York district sales manager for the Stanley Works, Steel Division. Mr. Connors has been a special representative for the Steel Division for the past 20 years.

• **R. M. Cherry** has been appointed assistant manager of General Electric's industrial heating division. Mr. Cherry became associated with General Electric in 1919 as a testing engineer and worked in the Schenectady and Pittsfield plants. In 1922 he was named industrial heating specialist at the Philadelphia office and in 1924 entered the industrial heating engineering department at Schenectady, later being transferred to the industrial engineering department there. Since 1936 Mr. Cherry has been connected with the industrial heating division.

• **Charles R. Hook** and **Elisha Walker** have been elected to the board of directors of the Westinghouse Electric & Mfg. Co., East Pittsburgh. Mr. Hook is president of the American Rolling Mill Co. and Mr. Walker is a partner of Kuhn, Loeb & Co. Mr. Hook is a resident of Middletown, Ohio, where he began his employment with the American Rolling Mill Company in 1902 as night superintendent. Mr. Hook has been a member of the executive committee of the National Association of Manufacturers since 1933 and was elected president of that organization in 1938.

• **William P. Drake**, recently appointed manager of sales of the Pennsylvania Salt Mfg. Co., has been placed in charge of the company's sales of acid and alkali-resistant cements and chlorinated organic chemicals, in addition to his former duties as manager of the Pennsalt Cleaner Division. **Albert H. Clem** and **Joseph J. Duffy**, formerly in the Detroit and Rochester territories respectively, were brought to Philadelphia to assist Mr. Drake in the Pennsalt Cleaner Division. **J. S. Dimon**, formerly the company's local representative in the Philadelphia area, has been given charge of sales and service in the transportation field, while **W. J. Hennessy**, with headquarters in Pittsburgh, is in charge of technical service to the steel industry. **Vincent A. Curll**, will also assist Mr. Drake.

• **Alfred Marchev**, vice-president of Republic Aviation Corp. and general manager of the Farmingdale plant, has been appointed executive vice-president, a newly-established post. In his new post he will assume responsibility for operation of the Evansville, Ind., plant of Republic Aviation, as well as for the Long Island factory. Mr. Marchev came to Republic Aviation in 1942 as assistant to the president. Later he was elected a vice-president, appointed general manager of the Farmingdale plant, and recently was elected to the board of directors.

• **Millard Romaine**, following a service of two years with the War Production Board in Washington, and Wright Field, Dayton, Ohio, recently returned to the Cincinnati Milling Machine Co., Cincinnati, to assume his new duties as assistant to the president. Mr. Romaine was formerly sales manager of the company.

• **Lester F. Nenninger**, engineering department head, has been named works manager, succeeding W. Peaslee who recently retired from active service. Mr. Nenninger will be in charge of engineering, works and production.

• **Swan E. Bergstrom**, formerly manager of the company's Detroit office, and recently assistant sales manager, has been appointed sales manager.

OBITUARY...

• **George Washington Connors**, chairman of the board, Connors Steel Co., Birmingham, died June 4, aged 79 years. He went to Birmingham from Atlanta in 1908 and shortly after his arrival established the Connors-Weyman Steel Co.

• **Dr. Philip H. Kreuscher**, for 7 years chief surgeon, Chicago district, Carnegie-Illinois Steel Corp. died last week at Wesley Memorial Hospital, Chicago. He was 59 years of age and had retired from the steel corporation in February of this year.

• **William A. Sinnott**, assistant to division superintendent of steel production, in charge of personnel, of the open hearth department of South works, Carnegie-Illinois Steel Corp., died last week at his home in Chicago. Mr. Sinnott was 44 years old and had been employed at South works since 1917.

• **Sanley Keleske**, acting president of the Wisconsin Screw Co., Racine, Wis., and associated with the R. & M Mfg. Co., West Allis, Wis., died May 23 after a short illness. He was 45 years old.

• **George L. Grimes**, owner of the Grimes Molding Machine Co., Detroit, died at his home May 28. He helped design the first castings on molding machines for multiple production at the Ford Motor Co. and also installed two units of the core room of the Buick Motor Division, Flint, and two for the Dow Chemical Co., Midland.

• **Harry F. Plagenz**, vice-president and treasurer of the Cuyahoga Spring Co., Cleveland, died May 21.

• **Fred W. French**, vice-president of the American Brass Co. and founder of the company's small tube branch, died recently. He was 80 years old. In 1905 he founded the French Mfg. Co. and has been an American Brass Co. executive since 1929.

• **Brig. Gen. Lyman Parsons Hubbell**, president of the Fillmore Avenue Foundry & Iron Works, Inc., from 1906 to 1931 and later senior engineer in the New York State public works department, died May 28 at his home in Buffalo. He was 68 years old.

• **Charles D. Mills**, 67, marine surveyor and Buffalo district manager of the American Bureau of Shipping, died May 27, aged 67 years.

• **I. L. Jennings**, retired vice-president of the Lamson & Sessions Co., Cleveland, died May 30. He was 58 years old.

• **R. H. Chadwick**, assistant to the manager in charge of engineering at the Fort Wayne Works of the General Electric Co., died May 29 after an illness of several weeks. He was 51 years old. In 1926 Mr. Chadwick was appointed engineer of the transformer department at Fort Wayne and continued in that capacity until April, 1941, when he was made assistant to the manager in charge of engineering.

MACHINE TOOLS

. . . News and Market Activities

Builders Rushing Allotments to Mills

Cleveland

• • • **Machine tool third-quarter** steel allotments were received during the past week or so, and builders are now in the process of transmitting to the mills the allotment numbers for orders that have been on mill books for some time. As mill books are filled pretty solid for the third quarter, any additional requirements that builders might have over and above what they have already ordered and are now furnishing allotment numbers for will stand a pretty slim chance of being filled.

As to activity in the industry during the past two or three weeks, there has been very little on the unusual side. Builders are working at or as close to capacity as possible to fulfill demands for machine tools. This is a bit paradoxical to normal trends, because usually as an end of a machine tool boom appears in sight there is a tapering off or a holding back of production to make business last as long as possible. In this case, however, the end of inflated tool demands is pretty well known to be within the next six months, but still producers are working frantically to get out all of the orders now on their books.

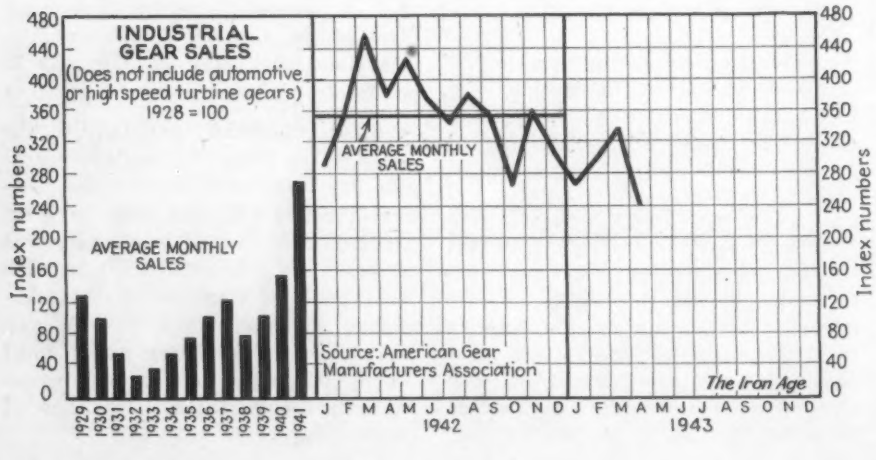
Instead of a tapering off of business, which might be expected, the end will be a complete and very sudden drop in production. Signs of this sudden drop-off in business have been evident for the past several months, being a cutting of material allotments by the WPB, the seeking of other types of business by the builders, and the setting up of production departments for production of other equipment on a subcontract basis by the builders.

For the most part, prime contractors all over the country are now seeking the production capacities of the various machine tool builders to handle the manufacture of such parts as aircraft subassemblies, diesel motor parts, etc., but with the increase in cancellations and cutbacks in war contracts, this condition may not last very long. Cleveland Army Ordnance representatives recently stated that cutbacks and cancellations of Army contracts in the Cleveland district might become quite pronounced as a result of the scarcity of materials during the next nine months, and if this is the case with Ordnance contracts, it is quite likely the case with contracts of other buying agencies.

There is one point in favor of machine tool builders, and that is that because of the industry's precision equipment, much of the newly acquired work will be on aircraft and naval engine contracts. Here, the work is still expanding and there is little likelihood of any major cutbacks or cancellations of contracts.

Gear Sales Decreased 28 Per Cent in April

. . . The gearing industry as represented by the members of the American Gear Manufacturers Association shows a decrease of 28 per cent in the business booked in April as compared with March. The April index figure was 240 compared with 334 for March.


INDUSTRIAL GEAR SALES
(Does not include automotive or high speed turbine gears)
1928 = 100
AVERAGE MONTHLY SALES
AVERAGE MONTHLY SALES
Index numbers
Source: American Gear Manufacturers Association
The Iron Age
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941
J F M A M J J A S O N D J F M A M J J A S O N D
1942
1943

Chafee Succeeds Johnson As Tools Division Director

• • • **The appointment** of John S. Chafee as director of the Tools Division of the WPB was announced last week by Donald D. Davis, operations vice-chairman. Mr. Chafee succeeds George H. Johnson, who resigned to return to private industry. The former director is president of the Gisholt Machine Co., of Madison, Wis. Mr. Chafee has been deputy director of the Division since last November.

Post-War Markets Under Study

Cincinnati

• • • **The district machine tool** market is without feature. While manufacturers indicate a reasonably satisfactory flow of new business, production schedules are gradually catching up with backlogs. At the same time, most of the tool makers in the area are exploring the possibilities of other types of products so that they may continue to do their full share in the war effort as well as in the peace to follow. On the question of peace-time production, most of the firms in this area have been exploring various avenues and ideas with research men in charge of departments varying in size in proportion to the size of the company to develop new manufacturing possibilities in the post-war era.

Curtiss-Wright Development Division Opened in N. J.

• • • **The newly formed development division** of the Curtiss-Wright Corp. has been set up at Bloomfield, N. J., where it will collaborate with the other three divisions of the corporation on special problems of production of airplanes, engines and propellers. The division has taken over a four-story factory building formerly occupied by Johnson & Johnson, Inc. Peter F. Rossmann, who up until recently has been in charge of research and development of the airplane division of Curtiss-Wright at Buffalo, is general manager of the new development division. For many years prior to 1936 when he joined Curtiss, he was head of the production design department of the Packard Motor Car Co., Detroit.

4" OF CAST STEEL REMOVED IN MILLING . . . . . BORE LOCATIONS HELD TO ±.001"

G & L Machine Used for Both Heavy Milling and Accurate Boring of 34-ton Part

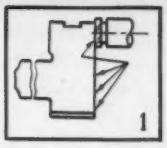
Here's another interesting example of machining extremely heavy parts. This 34-ton cast steel hydraulic press cylinder is completely machined in 3 settings. The machine used is a G & L No. 570 Floor-type Horizontal Boring, Drilling and Milling Machine with a 7" diameter spindle. The part is stationary and mounted directly on parallels on the floor plate. Bores are located by adjusting the column on the runway and the headstock on the column. The operator does this with ease through the use of electrical push-button controls located on the machine headstock.

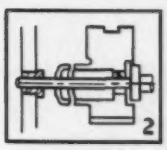
G & L Telescopic Vernier Sight Simplifies Locating Bores Accurately

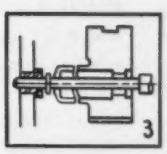
The machine is provided with a G & L Telescopic Vernier Sight which makes it possible for the machine operator to make settings in thousandths, *of both the headstock and column,* without leaving his operating position on the platform. This telescopic sight can be installed on any machine of this type which has scales and verniers. Write for Bulletin VS-3.

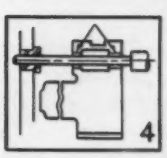
G & L machines are being used for an endless variety of machining operations on both small and large parts in many industries. With G & L attachments and accessories there is practically no combination of operations that cannot be performed with speed and economy. Feeds and speed ranges cover practically any cutting requirements.

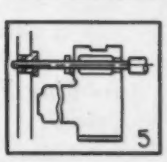
G & L engineers will be glad to make recommendations for faster machining of your work on G & L equipment.

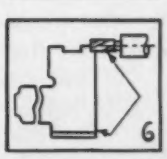


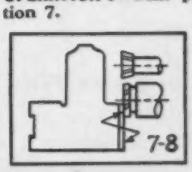


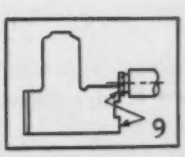












VERSATILITY FOR HEAVY DUTY AND ACCURATE MACHINING

1st Set-up

Set casting on parallels mounted on floor plate.

OPERATION 1—Face mill.

OPERATION 2—Pick up center bore and record vernier readings of headstock and column runway.

Bore, counterbore, chamfer 8"—38¾" and 39¾" diameter bores.

OPERATION 3—Backface 8" bore with Continuous Feed Facing Head mounted on bar.

OPERATION 4—Pick up, bore and chamfer three 15.437" holes and two 18" diameter holes, using scales and verniers on head and column runway.

OPERATION 5—Backface two 18" bores with Continuous Feed Facing Head before pulling bar out of the bores.

OPERATION 6—Take locating cut on pads to accurately establish their dimensions from the center bore. The reading of the headstock vernier will be the center bore reading, plus or minus, the distance the pad is from the center bore, plus ½ the diameter of the end mill used.

2nd Set-up

Set up on finished face on floor plate, aligning from the finished part of the pads.

OPERATION 7—Face mill pads.

OPERATION 8—Form mill inside edges of pad. (15° Dovetail Slide.)

3rd Set-up

Reverse casting, again, aligning from finished pads.

OPERATION 9—Mill pads similar to Operation 7.

GIDDINGS & LEWIS MACHINE TOOL COMPANY

136 DOTY ST., FOND DU LAC, WISCONSIN

FREE DATA *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 63.*

G&L

NON-FERROUS METALS

. . . News and Market Activities

Maximums Set for New Scrap Grades

• • • Two new grades of copper alloy scrap, together with maximum prices for each, were announced June 4 by OPA.

The new grades are tinny bronze (phosphor bronze) solids with a maximum base price of 10.50c. a lb., and zincy bronze solids with a maximum base price of 8c. a lb., both prices subject to the established deduction for non-metallic impurities.

The grades are established in amendment No. 1 to maximum price regulation No. 20 (copper scrap and copper alloy scrap) which becomes effective June 10, 1943.

The amendment also makes the following additions and changes in the regulation: 1. A maximum price of 6.04c. a lb., f.o.b. point of shipment, is established for lead-covered telephone and power cable scrap which has been scrapped by the Bell System. 2. Refineries who customarily recover gold or silver in the treatment of scrap containing precious metals, are authorized in the amendment to pay a premium for the gold or silver content if the gold content exceeds 0.05 of a troy oz. per ton, or if the silver content exceeds 5 troy oz. per ton. 3. The amendment exempts from price control the charge made for processing copper-bearing material on toll. This frees completely from price control any copper-bearing material sold, delivered or processed on toll. Previously no maximum price governed such sales of copper-bearing material, but the charge for processing the material on toll was subject to the general maximum price regulation. 4. To correct an error in the regulation, yellow brass castings are moved to group 2 from group 3 in quantity premium pricing classifications.

•

Silver Substitution Saves Tin

• • • An estimated 3000 tons of tin will be saved in 1943 and 5000 in 1944 by a single use of silver-lead instead of tin-lead solder, WPB has announced. This large tin saving will result from the use of silver-lead solder in 40 per cent of the 1943 output and 70 per cent of the 1944 output of cans for foods, household products, chemicals and other purposes.

The silver-lead solder contains about 2.5 per cent silver, 5 per cent tin and 93.5 lead, while the tin-lead solder contains 30 to 40 per cent tin and 60 to 70 per cent lead. And since lead has almost ceased to be a critical material—all restrictions having recently been removed from its use for essential purposes—the increased consumption of that metal is no problem.

•

Lead Controls Relaxed

• • • Government wartime controls over the use of lead, the one common metal available in sufficient quantities not only to fill all military and essential civilian requirements but also to be used in place of critical materials, have been further relaxed through issuance by WPB of a revised General Preference Order M-38 on May 26. This liberalized order places no restrictions whatsoever on the use of lead for purposes considered essential by WPB and should facilitate its use in place of scarce materials. The only restrictions on use are contained in a short list of prohibited items, all considered non-essential by WPB.

•

WPB Examines Silver Users

• • • A survey to determine the degree of compliance with wartime regulations on the use of silver is being conducted by about 50 examiners from the Federal Trade Commission acting as WPB examiners.

The survey is being conducted by WPB's Compliance Division, which stresses the need for strict enforcement of silver conservation order M-199, because of increasing substitution of silver for scarcer materials.

•

Jobbing Founders Polled

Chicago

• • • More than 400 non-ferrous jobbing founders are being polled by mail by the Non-Ferrous Founders' Society of this city for data on how OPA's MPR 125 is affecting their business. This step is part of the society's efforts to obtain modification of certain phases of the price regulation.

Among the modifications sought is the elimination of "across the board" price reductions to persons, or on classes of castings where metal cost has not declined or had not declined by the full amount of the 1½c. and 3c. reductions; and that members of the industry subject to the regulation be accorded the same exemption on small orders as is accorded by the regulation to small operators who are doing less than $50,000 business annually.

E. W. Horlebein, Gibson & Kirk Co., Baltimore, is chairman of the committee making the survey, and R. M. McClure, Chicago, is secretary.

•

Zn Output Little Affected by Floods

• • • Zinc production in the Tri-State area, which at first appeared to be seriously affected by the mid-west floods, will not be curtailed to any appreciable extent, WPB revealed. In fact, it is believed that what temporary loss of output may be sustained at the moment will be amply made up before the end of the year. The major producing mines have been completely pumped out and are operating, broken power lines are restored and all required power is flowing in the area.

•

Lead Supply Easier

• • • The position in the nation with respect to lead has eased considerably since the first conservation orders were issued, WPB revealed May 26. At the same time, the Board announced issuance of Limitation Order M-38, as amended. The purpose of the amended order is to make lead more readily available as a substitute for more critical materials going into essential production.

A survey of the lead production, consumption and stockpile picture has shown that it is no longer necessary to restrict any of its essential uses. Thus, hereafter, only non-essential uses will be controlled by Order M-38; as amended. The order does away with the 90 per cent limitation which existed on all uses, and provides that only List A items be prohibited from any use whatever.

There are few changes in List A. They are:

(1) To omit certain items under the heading "building supplies" in order to make the prohibitions on such supplies conform to the restrictions of the Army and Navy list and these two lists are now identical with respect to the use of lead in building supplies.

(2) To specify the non-essential uses of foil which are prohibited, rather than refer to permitted uses under List B, since List B has been abolished.

(3) To permit lead to be used for certain limited purposes in caskets and casket hardware.

With Order M-38 as amended, M-38 has been formally revoked and M-38-c has been superseded.

Refiner, Smelter Quotations

(Cents per lb.)

Copper, electrolytic, Conn. Valley	12.00
Copper, electrolytic, New York	11.75
Copper, Lake	12.00
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67
Lead, St. Louis	6.35
Lead, New York	6.50
Aluminum, virgin 99+%, delivered	15.00
Nickel, electrolytic, base refinery	35.00
Magnesium, 99.9+%, carlots	21.50
Magnesium, 12-in. sticks, carlots	30.00
Cadmium, delivered	90.00

ALUMINUM, No. 12 foundry grade (No. 2), 14.50c. per lb.; steel deoxidizing grades, 12.50c. to 14.75c. per lb. ANTIMONY, Asiatic, New York, nominal; American, 14.50c. a lb., f.o.b. Laredo, Tex., smelter. MERCURY, $191 to $193 per 76-lb. flask, f.o.b. shipping point or port of entry. BRASS INGOTS, commercial 85-5-5-5 (No. 115), 12.25c. a lb. COBALT, 97 to 99 per cent, $2.11 per lb. BERYLLIUM COPPER, 3.75 to 4.25 per cent Be., $15 per lb. contained Be. GOLD, U. S. Treasury, $35 an oz. INDIUM, 99.5 per cent, $10 per troy oz. IRIDIUM, $165 per troy oz. PALLADIUM, $24 per troy oz. PLATINUM, $35 per oz. SILVER, open market, New York, 44.75c. per oz. ARSENIC, prime, white, 99 per cent, 4c. per lb.

Copper, Copper Base Alloys

(Mill base prices)

Sheet: Copper, 20.87c.; high brass, 19.48c.; low brass, 80 per cent, 20.15c.; red brass, 85 per cent, 20.36c.; commercial bronze, 90 per cent, 21.07c., 95 per cent, 21.28c.; manganese bronze, 28.00c.; muntz metal, 22.75c.; naval brass, 24.50c.; phosphor bronze, grades A, B, 5 per cent, 36.25c.; Everdur, Herculoy, Olympic or equivalent, 26.00c.; nickel silver, 5 per cent, 26.50c.

Rods: Copper, hot rolled, 17.37c.; drawn, 18.37c.; free cutting brass, 15.01c.; low brass, 80 per cent, 20.40c.; red brass, 85 per cent, 20.61c.; commercial bronze, 90 per cent, 21.32c., 95 per cent, 21.53c.; Muntz metal, 18.87c.; naval brass, 19.12c.; phosphor bronze, grades A, B, 5 per cent, 36.50c.; Everdur, Herculoy, Olympic or equivalent, 25.50c.; nickel silver, 5 per cent, 28.75c.

Extruded Shapes: Copper, 20.87c.; architectural bronze, 19.12c.; manganese bronze, 24.00c.; Muntz metal, 20.12c.; naval brass, 20.37c.

ALUMINUM

Tubing: 2 in. O.D. x 0.065 in. wall; 2S, 40c. per lb. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c. per lb.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base price for tubing; 30,000-lb. base price for plate, flat stock. Variations from the above gage, size, temper, finish and quantity require extras.

Extruded Shapes: "As extruded" temper: 2000-lb. base price. 2S and 3S, factor No. 1 to 4, 25.5c. per lb.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by the weight per lineal foot. All prices above are subject to factor number range, temper, length, dimensional tolerances and quantity extras.

Wire, Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Variation from the above size, temper, finish and quantity require extras.

MAGNESIUM

Sheet, rod, tubes, bars and extruded shapes are subject to individual quotation. Magnesium Metal Turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c. a lb.

NON-FERROUS SCRAP METAL QUOTATIONS

Copper, Copper Base Alloy

(Current OPA maximum prices, cents per lb., f.o.b. point of shipment, plus premiums for quantities and special preparation.)

Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	8.00
Old rolled brass	7.75
Admiralty condenser tubes	8.00
Muntz metal condenser tubes	7.50
Plated brass sheet, pipe reflectors	7.50
Manganese bronze solids	7.25[1] 6.25[2]
Manganese bronze borings	6.50[1] 5.50[2]

Group 4

Automobile radiators	7.00

Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Aluminum

(Current OPA maximum prices, cents per lb., for less than 1000 lb. lots, f.o.b. point of shipment, plus premiums for quantities and special preparation.)

Plant scrap, segregated

2S solids	10.00
All other solids	9.50
Borings and turnings	7.50

Plant scrap, mixed

All solids	8.50
Borings and turnings	6.50

Obsolete scrap

Pure cable	10.00
Old sheet and utensils	8.50
Old castings and forgings	9.00
Pistons, free of struts	9.00
Pistons, with struts	7.00

For lots of 1000 to 19,999 lb., add 1c. to above prices except for old castings and forgings, pistons free of struts and pistons with struts for which there is a premium of ½c. a lb. For lots of 20,000 lb. or over add 1½c. a lb. to prices listed above.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots of 1500 lb. and over add 1c. per lb.

Zinc

(Current OPA maximum prices, cents per lb., f.o.b., shipping point.)

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Soft and hard lead, including cable lead, f.o.b. point of shipment, deduct 0.55c. per lb. from basing point prices for refined metal.

Nickel

Nickel content 98 + per cent, copper under ½ per cent, 26c. per lb.; 90 to 98 per cent nickel, 26c. per lb. of contained nickel.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅞
Electrolytic, full size, 22⅞c., cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., for quantities, based on delivery from New York City)

Copper cyanide, tech., 100-lb. bbls.	34
Copper sulphate, 99.5 crystals, bbls. 1-5	5.65
Nickel salts, single, 425-lb. bbls.	13-13.5
Silver cyanide, 100 oz. lots	40.82-41⅛
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33
Zinc sulphate, 89% crystals, bbls.	6.8

SCRAP

. . . News and Market Activities

Order May Be Hurting Alloy Scrap Use

• • • **The experience of** at least one large scrap firm seems to suggest that the total consumption of alloy scrap may suffer as a result of the recent WPB order requiring an 8 per cent charge of alloy turnings in all alloy heats. First evidence of such a trend in the market showed in a definite reluctance by consumers to purchase alloy solids from a public offering of both alloy solids and turnings while the turnings moved at a rate presumed to be based upon the 8 per cent requirement.

In a unique move to sell off an accumulation of segregated alloy scrap, the Iron & Steel Products, Inc., of Chicago mailed a circular offering some 94 carloads of various grades of alloy turnings and solids from a "remote" Texas base and also Chicago. This was done in April and latest reports from the concern, originating in a letter to WPB on the subject, indicate that only 27 carloads of this material moved and of these only one was for alloy solids.

Drawing an opinion from the response to the "for sale" circular Frank Parker, chairman of Iron & Steel Products, Inc., suggests in his letter that it might be explained by the fact that consumers do not wish to increase their stocks of solid scrap but are buying turnings to comply with the WPB requirements. The statement implies that purchasers are limiting their stocks of all alloy scrap to the minimum of 8 per cent of charging needs and since they must use this percentage in turnings, are content to use turnings alone thus cutting overall consumption of alloy scrap to the minimum percentage in favor of primary metals.

o o o

Auto Scrap Quota Cut To Save Usable Parts

Washington

• • • **The 60-day turnover** requirement for the automobile graveyards of the nation has been suspended to allow owners to comply fully under the recently issued WPB Order M-311, the Salvage Division announced last week.

This order provides that on and after June 1, no auto wrecker or scrap dealer, regardless of any previous contract, agreement or other commitment may scrap, sell as scrap, or deliver as scrap serviceable used automobile parts of the principal functional types.

It is estimated that scrap shipments from auto graveyards will decline sharply in favor of saving parts vital to the maintenance of transportation. Consequently, the original quota of 2,500,000 tons of scrap iron and steel that was established for auto graveyards for 1943 is being revised to 1,500,000 tons. During the first three months of 1943, scrap has flowed from auto graveyards at the average rate of 183,000 tons per month.

In suspending the sixty-day turnover policy, the Salvage Division has recommended to auto wreckers that a strong jalopy procurement program be adopted so that large quantities of scrap, such as dismantled bodies, frames, wheels and other parts which do not fall within the provisions of order M-311, will continue to move to consuming steel mills.

•

ST. LOUIS—The first shipment on a contract to deliver 15,000 tons of scrap iron over the next six months has been made to Hyman-Michaels by the U. S. Army, which is to collect the scrap from rural sections in the eastern half of Missouri. The collection is to be made by soldiers from Fort Leonard Wood at Rolla, Mo., which also will furnish 45 trucks. OPA prices are to prevail and the payment made to the U. S. Treasury Department. The scrap is being donated to the government.

An improvement in receipts was noted last week because loaded cars tied up by the floods are moving now. However, the highways are still in a bad condition and the movement of unloaded scrap has been slowed down. Mills are said to have lost a week's inventory as a result of the halting of shipments during the floods.

•

CHICAGO—Scrap supplies moving into the Chicago area are quite sufficient for present needs, but dealers and yard operators indicate that no stocks are being built up. The turnings situation has tightened up slightly, with supplies somewhat below what they were a month ago. This is believed largely the result of cutbacks and shifts in war orders.

•

PITTSBURGH—Some producers are still dipping into stocks to maintain current operations. One interest will be forced to use far more scrap than had been the case owing to a deficiency in hot metal due to the coal strike. At least three blast furnaces were down for repairs before the strike started, thus throwing an added burden on scrap supplies due to less pig iron.

•

PHILADELPHIA — There has been little change in the flow of scrap in this district. Some mills are still selective in their acceptance of scrap grades. It is felt here that Order M-311 will cut down by at least 800 to 900 lb. the scrap yield of each jalopy.

•

BOSTON—Heavy melting steel is moving fairly well, according to brokers, turnings moderately so, bundled material, mixed borings and turnings only occasionally, and stove plate, breakable cast and most other items scarcely any. Car shortages are reported spasmodically and the gasoline shortage has slowed up movement of materials in and out of yards.

•

Turning Collections Only 25% of WPB Expectations

Cleveland

• • • **Previous WPB** estimates on the availability of turning scrap are appearing to be far in excess of the amount actually appearing. Some 360,000 tons a month was the original expectations of authorities on the supply of this material, based on the difference of weight between ingots and billets and that of the actual finished products. However, the amount actually coming into the scrap yards does not exceed 90,000 tons a month.

The cause of this low rate of return on turnings has not yet been discovered, but a special committee of the WPB's Salvage group is delving into the problem. There is little likelihood that the scrap is not being generated, and to all appearances it would seem that it is accumulating at a very high rate in plants throughout the country that are generating such material.

•

Lake Scrap Shipment Reported

Buffalo

• • • **Increased deliveries** of industrial scrap to yards was reported this week. First lake freighter cargo of scrap, 5,000 tons from the Duluth area, has been unloaded at the dock of one of the district's largest consumers. Expected barge shipments from the Atlantic seaboard failed to arrive, high water in the Mohawk River balking state canal navigation.

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
							Low Phos.		Heavy Structural and Plate			Foundry Steel				
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.00	15.00	12.50	14.00	15.50

*Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK city or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakmont, Cal. Claymont, Del., includes the switching point of Chester, Pa. Chicago includes Gary, Ind., switching district.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. **Pit scrap, ladle skulls, slag reclaim,** etc., of 85% or more Fe priced—$2; 75 to 85% Fe—$4; under 75% Fe—$8 per ton. Mill scale of 65% or more Fe—$8 per ton. **Mill cinder and grindings,** shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

*At Memphis 50c.; Great Lakes ports $1; New England $1.25.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails: 3 ft. and Under	Scrap Rails: 2 ft. and Under	Scrap Rails: 18 in. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.	19.25	20.25	21.75	22.25	22.50	22.75
Seattle	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	15.50	16.50	17.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C: States not named in A and B: switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

	BASE PRICE SEGREGATED Solids, Lb. Cont. W	Turnings, Lb. Cont. W
Type 1	$1.80	$1.60
Type 2	1.60	1.40
Type 3	1.25	1.25
Type 4*	0.125	0.105
Type 5*	0.135	0.115

*Per lb. of scrap material.

BASE PRICE UNSEGREGATED SOLIDS

$1.50 per lb. contained W if 5% or more.

$1.15 per lb. contained W if over 1% and less than 5%.

$0.80 per lb. contained Mo if 1½% or more.

BASE PRICE UNSEGREGATED TURNINGS

$1.30 per lb. contained W if 5% or more.

$1.00 per lb. contained W if 1% and less than 5%.

$0.70 per lb. contained Mo if 1½% or more.

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	June 8, 1943	June 1, 1943	May 11, 1943	June 9, 1942
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	June 8, 1943	June 1, 1943	May 11, 1943	June 9, 1942
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.89	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.68	24.68	24.68	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.39	25.39	25.39	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$6.50	$6.50	$6.50	$6.00
Foundry coke, prompt	7.50	7.375	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	22.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 151 and 161.

Composite Prices . . .

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 8, 1943	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 9
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars[10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.22¢	2.35¢	2.28¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.17¢	3.41¢	3.39¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.75¢	3.68¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.47¢	3.73¢	3.69¢
Long ternes[2]	3.80¢		3.80¢									4.55¢		4.18¢	4.14¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.22¢	2.48¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.92¢	3.18¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity C_7R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.07¢	3.33¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	$5.00	$5.00	$5.00						$5.10					5.38¢	5.34¢
Electrolytic tin plate, box	$4.50		$4.50												
Black plate, 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.39¢
Mfg. ternes, special box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.52¢	2.80¢	2.27¢	2.51¢	2.49¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.52¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.52¢	2.55¢[13]	2.27¢	2.40¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.52¢	2.55¢[13]	2.27¢		2.49¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)					3.01¢	2.99¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton = 2.70¢)					2.82¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.47¢		
PLATES								(Coatesville and Claymont = 2.10¢)							
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.47¢	2.65¢	2.33¢	2.30¢	2.155¢
Floor plates	3.35¢	3.35¢									3.72¢	4.00¢		3.73¢	3.69¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.97¢	4.15¢		3.71¢	3.60¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.47¢	2.75¢		2.28¢	2.22¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)					3.10¢			2.94¢
Galvanized	add proper size extra and galvanized extra to bright wire base, above.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.54¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.74¢

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lot to manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [12] Boxed. [13] Portland and Seattle price, San Francisco price is 2.50c. [14] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILINGS—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote 2.35c. at established basing points, Calumet Steel division of Borg Warner may quote 2.35c., Chicago, on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote for shipment to Detroit area on Middletown base. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote 2.30c. established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMIFINISHED STEEL—Follansbee Steel Corp. may sell forging billets at $49.50 f.o.b. Toronto; Continental Steel Corp. may sell Acme Steel Co. at $34 for rerolling billets plus extras and freight; Ford Motor Co. may sell rerolling billets at $34 f.o.b. Dearborn; Andrews Steel Co. may sell forging billets at $50 at established basing points and slabs at $41; Empire Sheet and Tin Plate may sell slabs at $41 at established basing points and sheet bars at $39 f.o.b. mill; on lend-lease sales Northwestern Steel & Wire Co. may charge $41 per gross ton f.o.b. mill for rerolling billets; on lend-lease sales Wheeling Steel Corp. may charge $36 per ton for small billets, f.o.b. Portsmouth and $37 per ton for sheet bars f.o.b. Portsmouth; Laclede Steel Co. on semifinished sales for lend-lease shipped to eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

WAREHOUSE PRICES

(Delivered Metropolitan areas, per 100 lb. These prices do not necessarily apply for dislocated tonnage shipments when the f.o.b. City prices are used in conformance with OPA Schedule 49)

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	†† Hot Rolled, 2300	‡ Hot Rolled, 3100	†† Cold Drawn, 2300	‡ Cold Drawn, 3100
*Philadelphia	$3.518	$4.872[5]	$5.018	$3.922	$4.772	$3.605	$3.666	$3.822	$4.072	....	$7.116	....	....
*New York	3.590	4.613[2]	5.010	3.974[6]	4.774	3.768	3.758	3.853	4.103	6.008	7.158	7.303	8.453
*Boston	3.774	4.744	5.224	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.312	7.344	8.494
*Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
*Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
*Washington	3.596	4.841	5.196	4.041	4.741	3.796	3.930	3.941	4.041	....	....	....	....
Pittsburgh	3.35	4.00	4.75	3.60	3.20	3.40	3.40	3.35	3.65	7.45	5.75	8.40	6.75
Chicago	3.25	4.10	4.85[1]	3.60	3.50	3.55	3.55	3.50	3.75	7.35	5.65	8.40	6.75
Cleveland	3.35	4.05	4.62	3.50	3.20	3.40	3.58	3.25	3.75	7.55	5.85	8.40	6.75
Detroit	3.43	4.30	4.84[1]	3.43	3.40	3.60	3.65	3.43	3.80	7.67	5.97	8.70	7.05
Buffalo	3.25	4.30[1]	4.75[4]	3.82	3.52	3.62	3.40	3.35	3.75	7.35	5.65	8.40	6.75
Birmingham	3.45[3]	....	4.75[1]	3.70[3]	....	3.55[3]	3.55[3]	3.50[3]	4.43	....	....	....	....
St. Louis	3.39	4.24[2]	4.99[1]	3.74	3.61	3.69	3.69	3.64	4.02	7.72	6.02	8.77	7.12
St. Paul	3.50	4.35	5.00	3.85	3.83	3.80	3.80	3.75	4.34	7.45	6.00	8.84	7.44
Milwaukee	3.38	4.23[2]	4.98[1]	3.73	3.54	3.68	3.68	3.63	3.88	7.58	5.88	8.63	6.98
Cincinnati	3.42	4.37[2]	4.42[1]	3.67	3.45	3.65	3.68	3.60	4.00	7.69	5.99	8.50	7.10
Indianapolis	3.45	4.25	5.01[1]	3.75	3.28	3.70	3.70	3.60	3.97	7.67	5.97	8.72	7.07
Omaha	3.85	4.77	5.52[1]	4.20	....	4.15	4.15	4.10	4.42	....	....	....	....
Memphis	3.85	4.66	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	3.95	4.95	5.25	4.20	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	3.75	5.43	5.25	4.30	....	5.25	5.25	3.75	4.50	....	....	....	....
†Los Angeles	4.95	7.15	5.95	4.90	....	4.90	4.60	4.35	5.70	9.55	8.55	10.55	9.55
†San Francisco	4.55	7.55	6.60	4.50	....	4.65	4.35	3.95	5.55	9.80	8.80	10.80	9.80
†Seattle	4.65[7]	6.63	5.70[7]	4.25	....	4.75	4.45	4.20	5.75	....	8.00	....	....

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over: Exceptions: [1] 500 to 1499 lb. [2] 400 to 1499 lb. [3] 400 to 3999 lb. [4] 450 to 1499 lb. [5] 1000 to 1999 lb. [6] 0 to 1999 lb. [7] 300 to 10,000 lb. At Philadelphia galvanized sheets, 2500 more bundles; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; San Francisco, hot rolled sheets, 400 to 39,999 lb.; galvanized and cold rolled sheets, 750 to 4999 lb.; cold fin. bars, 0-299 lb.; hot rolled alloy bars, 0-4999 lb.; Seattle, cold finished bars, 1000 lb. and over, hot rolled alloy bars, 0-1999 lb.; Memphis, hot rolled sheets, 400 to 1999 lb., galvanized sheets, 150 and over; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, cold rolled sheets, 300 to 1999 lb.; galvanized sheets, 1 to 6 bundles; cold finished bars, 1 to 99 lbs.; SAE bars, 100 lb. Extras for size, quality, etc., apply on above quotations.

† Los Angeles, San Francisco and Seattle prices reflect special provisions of amendment No. 2 to OPA Price Schedule No. 49.

†† For zoned cities these grades have been revised to NE 8617-20.

* Base delivered prices according to price zones established by Amendment 14 to RPS 49 including the 3% transportation tax—not including the 6% freight increase of March 18, 1942, rescinded May 15, 1943.

‡ For zoned cities these grades have been revised to NE 9442-45 Ann'ld.

N. E. STEELS

(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar Strip	Billets, Blooms and Slabs	Bars and Bar Strip	Billets, Blooms and Slabs
NE 1320	.28/ .33	1.60/1.90	.040	.040	.20/ .35	....	....	....	.10c	$2.00	....	....
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35	....	....	....	.10	2.00	....	....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	....	....	....	.10	2.00	....	....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	....	....	....	.10	2.00	....	....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	....	....	....	.10	2.00	....	....
NE 8020	.18/ .23	1.00/1.30	.040	.040	.20/ .35	....	....	.10/ .20	.45	9.00	.95c	$19.00
NE 8442*	.40/ .45	1.30/1.60	.040	.040	.20/ .35	....	....	.30/ .40	.90	18.00	1.40	28.00
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	....	....	....	.40c	8.00	....	....
NE 9260	.55/ .65	.75/1.00	.040	.040	1.80/2.20	....	....	....	.40	8.00	....	....
NE 9262	.55/ .65	.75/1.00	.040	.040	1.80/2.20	.20/ .40	....	....	.65	13.00	....	....
NE 9415	.13/ .18	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30c	$26.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.80	16.00	1.30	26.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.20/ .40	.20/ .50	.08/ .15	.85	17.00	1.35	27.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9620	.28/ .33	1.20/1.50	.040	.040	.40/ .60	.40/ .60	....	....	.80	16.00	1.30	26.00
NE 9635	.33/ .38	1.20/1.50	.040	.040	.40/ .60	.40/ .60	....	....	.80	16.00	1.30	26.00
NE 9637	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	....	....	.80	16.00	1.30	26.00
NE 9640	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	....	....	.80	16.00	1.30	26.00
NE 9642	.40/ .45	1.30/1.60	.040	.040	.40/ .60	.40/ .60	....	....	.85	17.00	1.35	27.00
NE 9645	.43/ .48	1.30/1.60	.040	.040	.40/ .60	.40/ .60	....	....	.85	17.00	1.35	27.00
NE 9650	.48/ .53	1.30/1.60	.040	.040	.40/ .60	.40/ .60	....	....	.85	17.00	1.35	27.00

***Recommended for large sections only. Note: The extras shown above are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.**

PRICES

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.25 higher; f.o.b. Duluth, billets only, $2 higher. Delivered prices do not reflect new per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00
Alloy Steel: Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton	$54.00

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.25 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi, 3c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 202
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

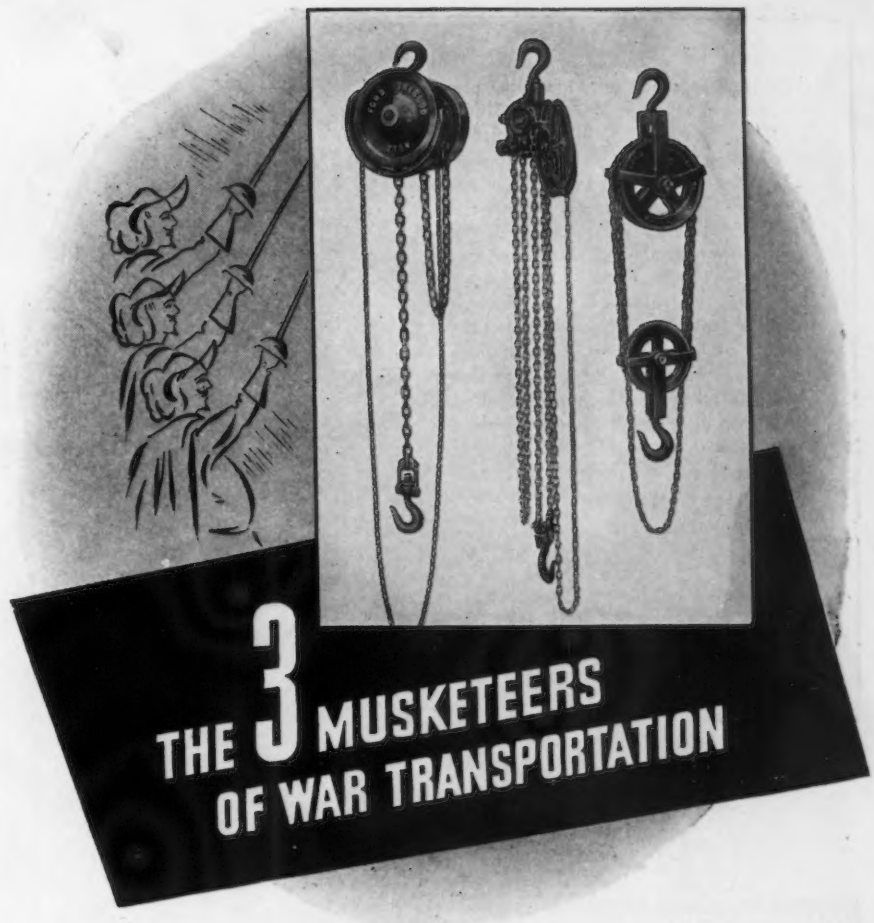
Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hotstrip	17.00c.	17.50c.	24.00c.	35.00c.
Cold st.	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.



FORD CHAIN BLOCKS are sturdy mechanical soldiers, and as such deserve the consideration given *all* soldiers. They should not be weakened by overload; they should have their regular ration of lubrication. Here are a few suggestions for keeping your **FORD CHAIN BLOCKS** on constant efficient duty:

- Keep equipment clean, well-lubricated and in good order.
- Don't exceed rated capacity.
- Inspect chain periodically and lubricate load chain regularly.
- Don't make lifts or pulls for which the hoist was not designed or intended.
- Don't bang the hoist around or permit the chain to foul with the load.
- Replace hooks when showing signs of distortion from overloading.
- Be sure the hoist has the characteristics and capacity necessary for the job.

Write for information on **FORD TRIBLOCS.** They range in capacities from ¼ to 40 tons. Available to all who have adequate priority rating.

Order from Your Distributor

FORD CHAIN BLOCK DIVISION

Philadelphia • Chicago • San Francisco

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

Welding has become a quantity production operation with C-F POSITIONERS because the welders themselves can now position giant weldments without a crane or sling crew. On the giant turbine gear blank shown the welder welds all sides and internal angles down-hand—just pushes buttons to tilt the blank up to 135° beyond horizontal or rotate it 360°, under variable speed control to make the endless peripheral welds. So it is thruout many shipyards, welders with C-F POSITIONERS are building parts and sub-assemblies which would require many more hours of labor, highly skilled men and machine tools to produce by other methods.

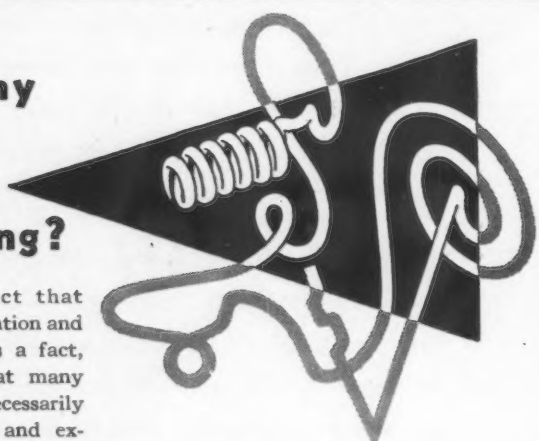
Write for Bulletin WP 22.

C-F POSITIONERS

help build ships for Victory

CULLEN-FRIESTEDT CO.
1303 S. KILBOURN AVE. CHICAGO, ILLINOIS

How many BENDS in a Spring?



Here's a subject that deserves close attention and investigation. It's a fact, sad but true, that many springs are unnecessarily intricate, difficult and expensive to make, all because of lack of understanding of the ultimate purpose. Ofttimes, a simplified design—or a different type of material can do wonders in the way of reducing costs and "upping" performance. Here's where experience in spring design pays off. Let the springmaker in on your requirements—in the early stages if possible.

A good spring in time saves nine!

DUNBAR *SPRINGMAKERS*

SPRINGS WIRE FORMS SMALL STAMPINGS

DUNBAR BROS. CO., Bristol, Conn.
Division of Associated Spring Corporation

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets *(½ in. and larger)*

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets *(7/16 in. and smaller)*

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing Points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PRICES

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh) *Per Lb.*

Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.15c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cutnails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
Annealed galvanized fence wire	3.40
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200 per Net Ton

Steel (Butt Weld)

	Black	*Galv.*
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½

Wrought Iron (Butt Weld)

½ in.	25	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Steel (Lap Weld)

2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½

Wrought Iron (Lap Weld)

2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17

Steel (Butt, extra strong, plain ends)

	Black	*Galv.*
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57

Wrought Iron (Same as Above)

½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Steel (Lap, extra strong, plain ends)

2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56

Wrought Iron (Same as Above)

2 in.	33½	15½
2½* to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

PERFORATED METALS

INDUSTRIAL and ORNAMENTAL

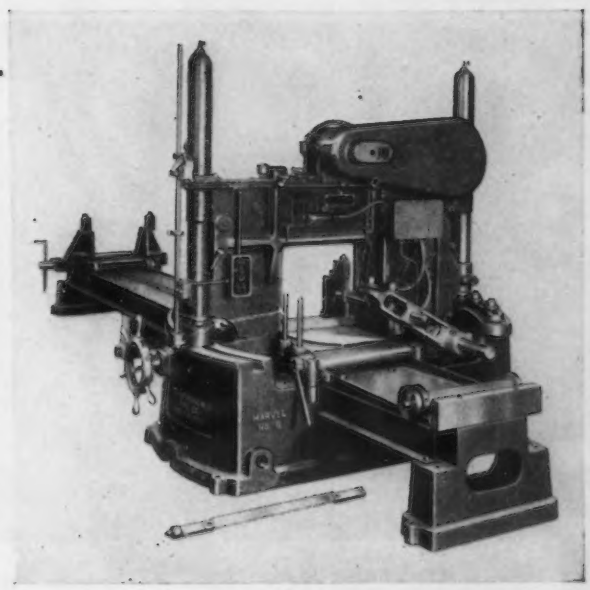
To produce the highest quality of perforated metal as used in the industrial arts and for ornamentation has been the ambition and persistent endeavor of this company. The highest quality best serves the user. We are here to serve you.

ANY METAL • ANY PERFORATION

The Harrington & King PERFORATING CO.

5657 FILLMORE STREET—CHICAGO, ILL. New York Office, 114 Liberty Street

CUTS the Toughest Steels and Largest Sizes *easily*



This giant hydraulic metal-cutting saw is more than just a larger hack saw. It is a new development in metal-cutting methods that introduces a new principle of metal sawing — the Roll-stroke blade action makes it possible to cut the toughest steels in the largest sizes easily and rapidly. It also permits a simple and efficient, very low pressure Hydraulic Feed System.

Built for heavy work, completely enclosed in heavy housing, this machine will stand up under the rough usage of the average steel mill warehouse and forge shop, where it will speed cutting-off, and reduce material loss.

MARVEL No. 18
Giant Hydraulic Hack Saw
Capacity 18"x18"
Cuts angles up to 45° by simply swiveling upper machine housing.

Write for Catalog

MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.

Eastern Sales Office
225 Lafayette St.,
New York

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston††	*$25.00*	*$24.50*	*$26.00*	*$26.50*	.....	.....
Brooklyn	*27.50*	.....	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.††	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.		24.50	.....	.....	29.00	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*23.94*	*23.94*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	*$31.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*22.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown*	24.00	23.50	24.50	24.00	*22.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	$28.00
Lyles, Tenn. fc.†	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

**Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

†Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

††Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $1 per gross ton above maximum prices.

Delta Chemical & Iron Co., Chicago, may charge $30 for charcoal iron at its Delta, Mich., furnace.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Powdered Metals

Prices are based on current market prices of ingots plus a fixed figure. For ton lots f.o.b. shipping point, in cents per lb.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23⅛c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh	13½ to 15c.
Iron, crushed, 200 mesh and finer	4c.
Iron, hydrogen reduced, 300 mesh and finer	33c.
Iron, electrolytic, unannealed, coarser than 300 mesh	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh	42c.
Iron, carbonyl, 300 mesh and finer	90c.
Aluminum, 100 and 200 mesh.	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh,	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh,	8½c. plus metal
Tin, 100 mesh	58¾c.

*Freight allowed east of Mississippi.

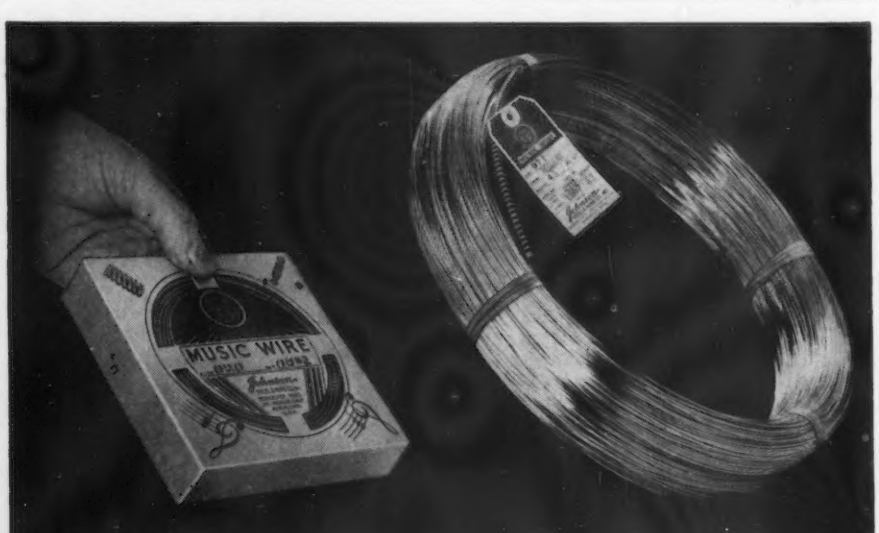
BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Lap Weld, Hot Rolled	Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%



XLO Music Wire is drawn under constant laboratory control from original steel to finished product . . . meets every demand of commercial and governmental specifications (WD 1085—WD 1095). In convenient attractive red and silver packages in units of ¼ lb., ½ lb., and 1 lb., also 5 lb. packages, and catchweight coils. Wire sizes .005" to .200" dia.

At present there are stocks in Worcester, Akron, Chicago and Los Angeles.

JOHNSON STEEL & WIRE CO., INC.
WORCESTER • MASSACHUSETTS
NEW YORK AKRON CHICAGO LOS ANGELES

PRICES

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorous, 51.50	4.35

*Adjustments are made to indicated prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

COKE

Furnace

	Per Net Ton
†Connellsville, prompt	$6.50*

Foundry

†Connellsville, prompt	$7.50
Fayette County, W. Va. (Beehive)	$8.10
By-product, Chicago	$12.25
By-product, New England	$13.75
By-product, Newark	$12.40 to $12.95
By-product, Philadelphia	$12.38
By-product, Cleveland	$12.30
By-product, Cincinnati	$11.75
By-product, Birmingham	$8.50†
By-product, St. Louis	$12.02
By-product, Buffalo	$12.50

Maximum by-product coke prices established by OPA became effective Oct. 1, 1941.

*Hand-drawn ovens using trucked coal are permitted to charge $7.00 per net ton, plus usual transportation. Maximum beehive furnace coke prices established by OPA, Feb. 8, 1942. †F.o.b. oven.

FLUORSPAR

	Per Net Ton
Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail	$25.00
Domestic, f.o.b. Ohio River landing barges	25.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	25.00

REFRACTORIES

(*F.o.b. Works*)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania & Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00

Chrome Brick	*Per Net Ton*
Standard, chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

ARMY E NAVY

Acceleration of materials handling tempo puts the spotlight on *safety*. Krane Kar's ease of operation, stability, unobstructed vision, full traction, and other safety features provide maximum manpower protection 168 hours a week. Write for literature.

Among the Users: American Smelting & Refining; Basic Magnesium; Lockheed Aircraft; Bethlehem Steel; Hercules Powder; DuPont de Nemours; Follansbee Steel Corp., General Motors, etc.

2½, 5, AND 10 TON CAPACITIES

Krane kar

SILENT HOIST WINCH & CRANE CO., 851 63RD ST., BROOKLYN, N.Y.

"HERCULES" RED-STRAND WIRE ROPE

You Can Depend On "Hercules" (Red Strand) Wire Rope

Highlights of Quality

1. Acid Open-Hearth Steel Wire
2. Rigid Tests and Inspections
3. Correct Manufacturing Methods
4. Furnished in both the Round and Flattened Strand constructions, in either Standard or Preformed Type.

• • Results are what count, and the performance record of this wire rope continues to make and hold friends.

There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

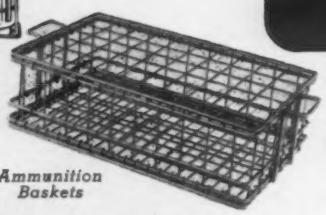
5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK • • • 90 West Street
CHICAGO • • 810 W. Washington Blvd.
DENVER • • • 1554 Wazee Street

SAN FRANCISCO • • 520 Fourth Street
PORTLAND • • 914 N. W. 14th Avenue
SEATTLE • • 3410 First Avenue South

HOW TO PUT THE "PROD" INTO WAR PRODUCTION *with* WIRE

Bottle Carriers



Ammunition Baskets

Fan Guards

Shelving & Grills

Woven, Welded or Formed Wire Parts

Complete Facilities for WELDED, WOVEN OR FORMED Wire Products

Replace a scarce part with its equivalent in wire. Group other small parts for "unit handling" in wire baskets and save time and space. Handle groups of products right side up in position for inspection, sorting, spraying, etc. in special wire trays and racks. Redesign with wire for lighter weight, faster drying or cooling, economy of material, etc.

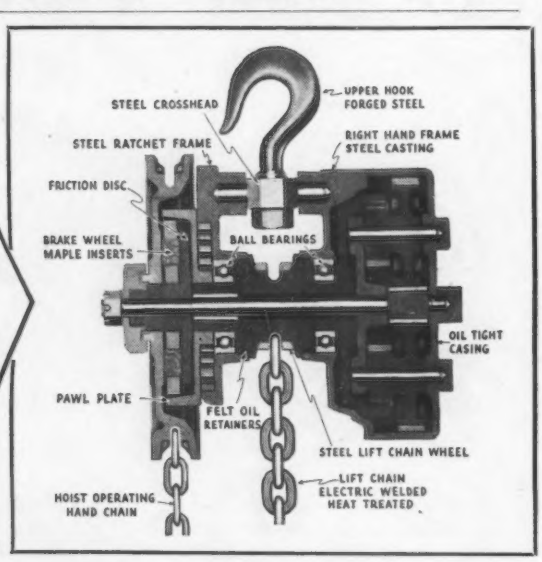
WIRE FORMS OR SHAPES OF ANY SIZE (Except Springs)

SHAPES: Forms, parts, etc.
SHELVING: Refrigerators, Stoves, Cabinets
RACKS: Oven, Refrigerator, Display
BASKETS: Dipping, Display, Tote, Rubbish, Pickling, Heat Treating
CRATES: Bottle, Tote
GUARDS: Fan, Heater, Window
TRAYS: Package
BROILERS: Meat
GRIDS: Camp
CARRIERS: Bottle, Package
POULTRY: Coops, Batteries
SPACERS: Reinforcing Steel
HANGERS and FORMS INSERTS for Concrete

UNION STEEL PRODUCTS

UNION STEEL PRODUCTS COMPANY
442 Pine Street • Albion, Mich.

Here is the **Chain Hoist** *for your job*



● Cutaway view of a Reading Multiple Gear Chain Hoist. Capacities from ½ to 20 tons.

READING CHAIN HOISTS are *engineered* to provide easy, safe lifting. Maintenance is simple, can be handled by an unskilled mechanic. *All the gears in your* Reading Chain Hoist *operate in a bath of oil.*

If you would like more information about these chain hoists that are engineered to *stay on the job,* drop us a line. We will be glad to send you a free copy of Catalog No. 58 which describes Reading Chain Hoists. Send for your copy *today!*

READING CHAIN HOISTS

Multiple Gear Hoists—½ to 20 tons; Army-Navy Type Hoists—½ to 10 tons; Differential Type Hoists—½ and 1 ton; Extended Chain Wheel Hoists—½ to 5 tons; Low-Head Hoists—2 to 12 tons; Quick-Speed Multiple Gear Hoists—up to 1 ton; Twin Hook Type Hoists—½ to 5 tons; Worm Geared Hoists—½ and 1 ton.

Reading Chain & Block Corporation, 2101 Adams St., Reading, Pa.

READING CHAIN HOISTS·ELECTRIC HOISTS OVERHEAD TRAVELING CRANES

FERROALLOY

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans, duty paid, 80%, per gross ton (carloads)	$135.00
Delivered Pittsburgh	$140.33
F.o.b. Southern furnaces	$135.00

For packed carloads, add $6 per gross ton; $10 for ton; $13.50 for less than a ton; $18 for less than 200 lb.

Electrolytic Manganese

99.9¼+%, less ton lots, per lb.	42c.
Ton lots	40c.
Annual contracts	38c.

Spiegeleisen

(Carlots, per gross ton, Palmerton, Pa.)

Domestic, 19 to 21%	$36.00
Domestic, 26 to 29%	49.50

Electric Ferrosilicon

(Per Gross Ton, Delivered Lump Size)

50% (carload lots, bulk)	$74.50
50% (ton lots, packed)	87.00
75% (carload lots, bulk)	135.00
75% (ton lots, packed)	151.00

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above Silvery Iron quotations of comparable analysis.

Ferrochrome

(66% to 72%, delivered lump size, on contract, per lb. contained Cr)

	Carlots	Ton Lots
4 to 6 carbon	13.00c.	13.75c.
2 carbon	19.50c.	20.25c.
1 carbon	20.50c.	21.25c.
0.10 carbon	22.50c.	23.25c.
0.06 carbon	23.00c.	23.75c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silicon Metal

Contract basis, f.o.b. producer's plant, freight allowed, 1 per cent iron, carlots, per lb.	14.50c.
Less-ton lots	15.25c.
2% iron, carlots	13.00c.
Less-ton lots	13.75c.

Silicon Briquets

Contract basis, carlots, bulk freight allowed, per ton	$74.50
Packed	$80.50
Ton lots	$84.50

Silicomanganese

(Per gross ton, delivered, carloads, bulk)

3.00 carbon	$120.00*
2.50 carbon	125.00*
2.00 carbon	130.00*
1.00 carbon	140.00*
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.†
Packed	6.05c.†
Less-ton lots	6.55c.†

*Spot prices are $5 per ton higher.
†Spot prices ¼c. higher.

Other Ferroalloys

Ferrotungsten, delivered, carlots, per lb. contained tungsten	$1.90
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Ferrovanadium, 35%-40%, contract basis, f.o.b. producers plant, usual freight allowances, open-hearth grade, per lb. contained vanadium	$2.70
Special grade	$2.80
Very special grade	$2.90
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5	$1.10
Ferroboron, contract basis, 17.50% boron minimum, f.o.b. Niagara Falls, carlots, per lb. alloy	$1.20
Ton lots	$1.25
Silcaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	23c.
Silvaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	40c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 100 lb. and over, maximum based on rate to St. Louis, per lb.	45c.
Bortam, f.o.b. Niagara Falls Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Borosil, 3% to 4% boron, 40 to 45% silicon, f.o.b. Philo, Ohio, per pound contained boron	$7.00
Ferrocolumbium, 50% to 60%, f.o.b. Niagara Falls, ton lots, per lb. contained columbium	$2.25
Less-ton lots	$2.30
Ferrotitanium, 40%-45%, f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained titanium	$1.23
Less-ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	$1.35
Less-ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore & St. Louis, per gross ton.	$142.50
3%-5% carbon	$157.50
Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala. carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75 per cent, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum	95c.
Calcium molybdate, 40%-45%, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00
Zirconium, 35-40%, contract basis, carloads in bulk or package, per lb. of alloy	15c.
Less-ton lots	16c.
Zirconium, 12-15%, contract basis, carlots, bulk, per gross ton.	$102.50
Packed	$107.50
Less-ton lots	$112.50
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, per lb.	7.50c.
Ton lots	8c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, carlots, freight allowed, per lb.	10.50c.
Less-ton lots	11c.

A.I.S.I. HY-TEN S.A.E.
N.E.

ALLOY STEELS FOR OFFENSE

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

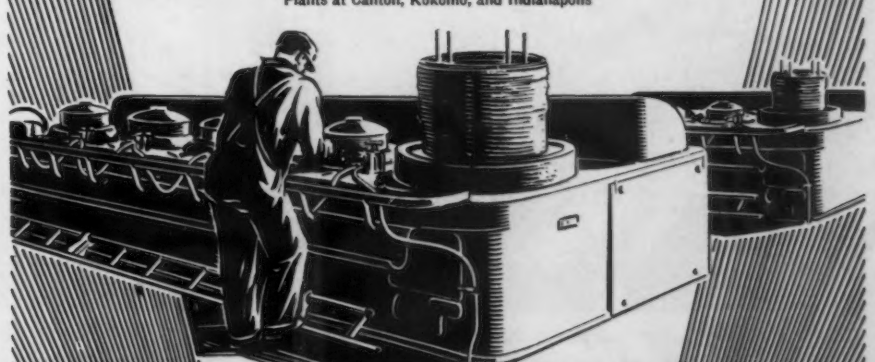
Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

WHEELOCK, LOVEJOY & CO., INC.
126 Sidney Street — Cambridge, Mass.
Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

WIRE
FOR A THOUSAND USES

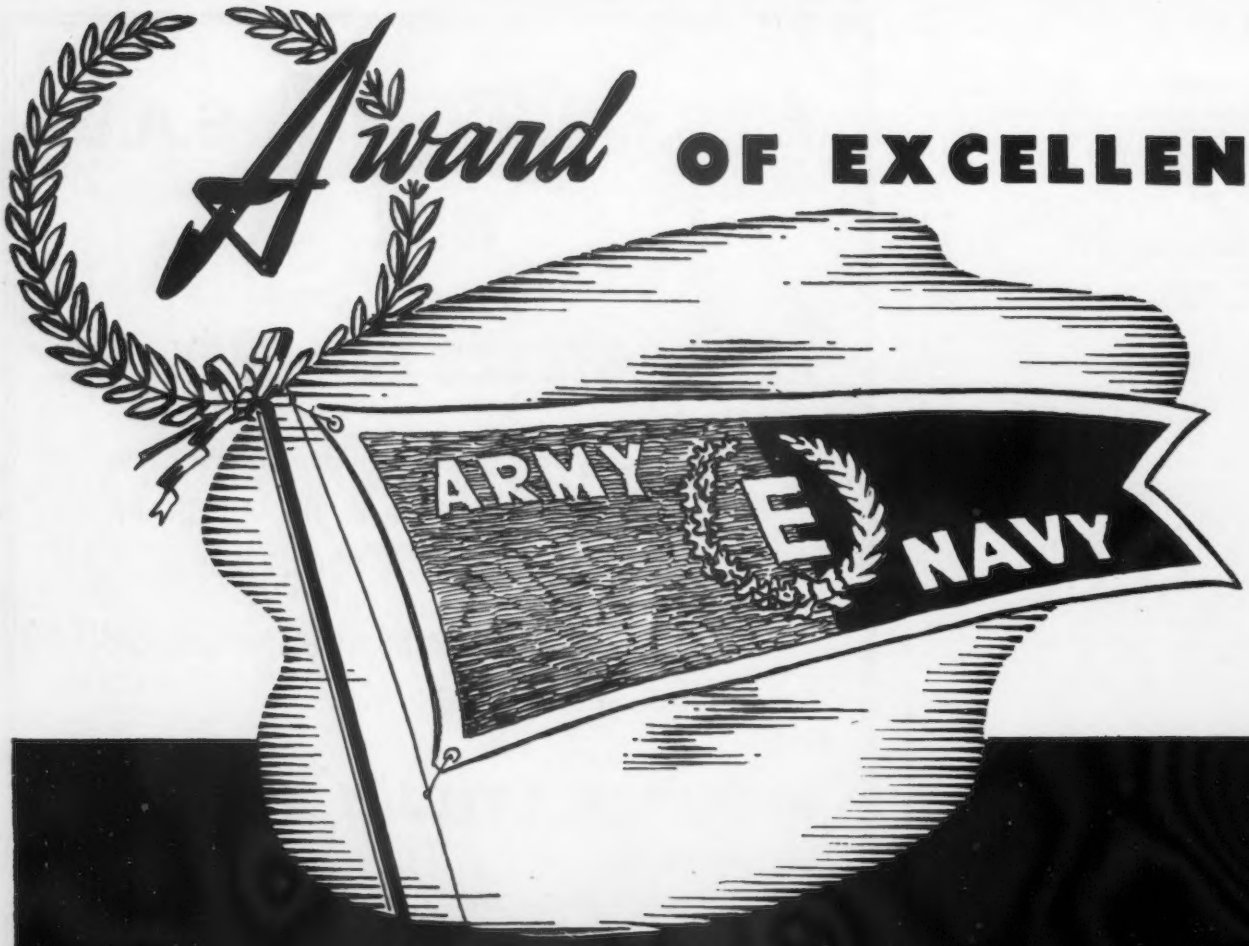
From rods to be forged into airplane parts to fine gauge wire for paper matches, Continental manufacturer's wire is made to meet exacting product requirements. When war needs can be satisfied, Continental will be better equipped than ever to serve your needs.

CONTINENTAL STEEL CORP., KOKOMO, INDIANA
Plants at Canton, Kokomo, and Indianapolis



CONTINENTAL SUPERIOR STEEL
CONTINENTAL STEEL CORPORATION
PRODUCERS OF—SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc. WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.

Award OF EXCELLENCE



In receiving the joint citation of the Army and Navy the men and women of Eclipse recognize that the award carries with it not only an honor but a responsibility. The coveted "E" Award flags flying above the two Eclipse plants inspire a patriotic glow in the heart of every Eclipse man and woman . . . an inspiration to an even greater accomplishment in our common objective . . . VICTORY! Our customers are assured that Eclipse employees will continue increasing and INCREASING the flow of Eclipse Cutting Tools until this war is safely over.

Eclipse

ECLIPSE COUNTERBORE COMPANY

TWO COMPLETE PLANTS IN DETROIT AND FERNDALE, MICHIGAN